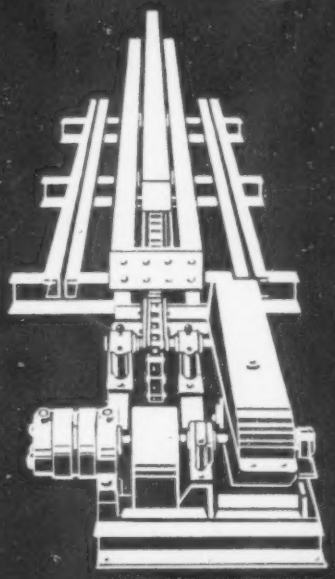
IRON & COAL

THE IRON AND COAL TRADES' REVIEW

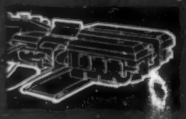
VOL. 182 Offices: John Adam House, 17-19 John Adam Street, London, W.C.2 Registered as a Newspaper
No. 4,859 LONDON: FRIDAY, JUNE 30, 1961

From face to surface

Sutcliffe serves mining



Tub and minecar handling equipment



Face mechanisation

Drilling equipment

Water infusion

Modern conveying methods

Surface handling schemes

Sutcliffe

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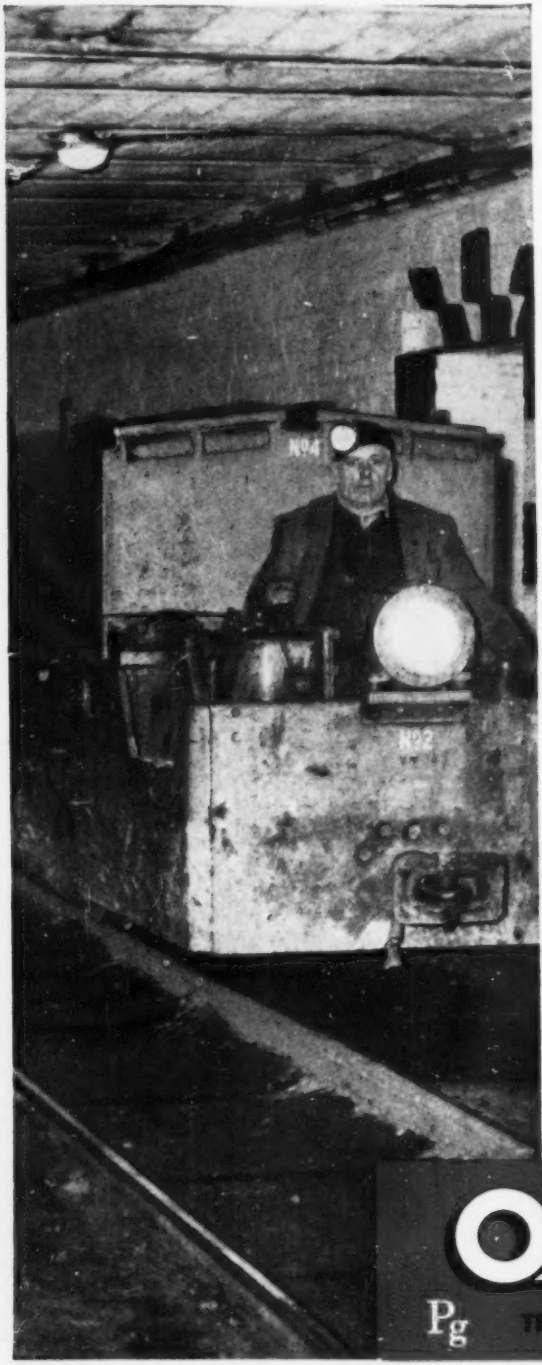

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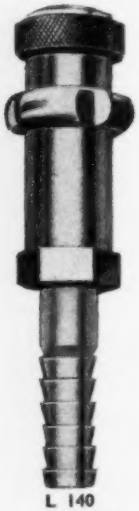
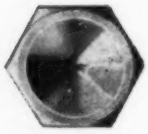


L 140
VARIABLE JET/SPRAY

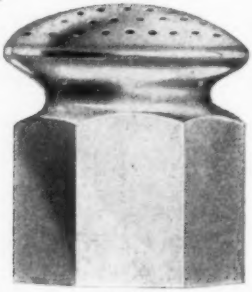
L 142
VARIABLE JET/SPRAY FIXED SPREAD

L 141
VARIABLE JET/SPRAY

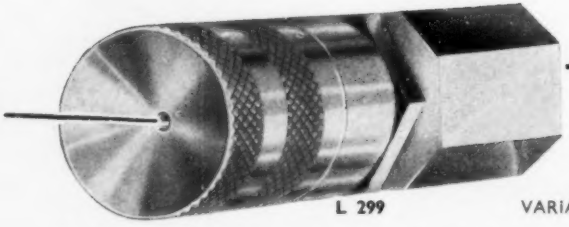
L 143



MIST SPRAY



L 175
TUB OR MINE CAR DOUCHE



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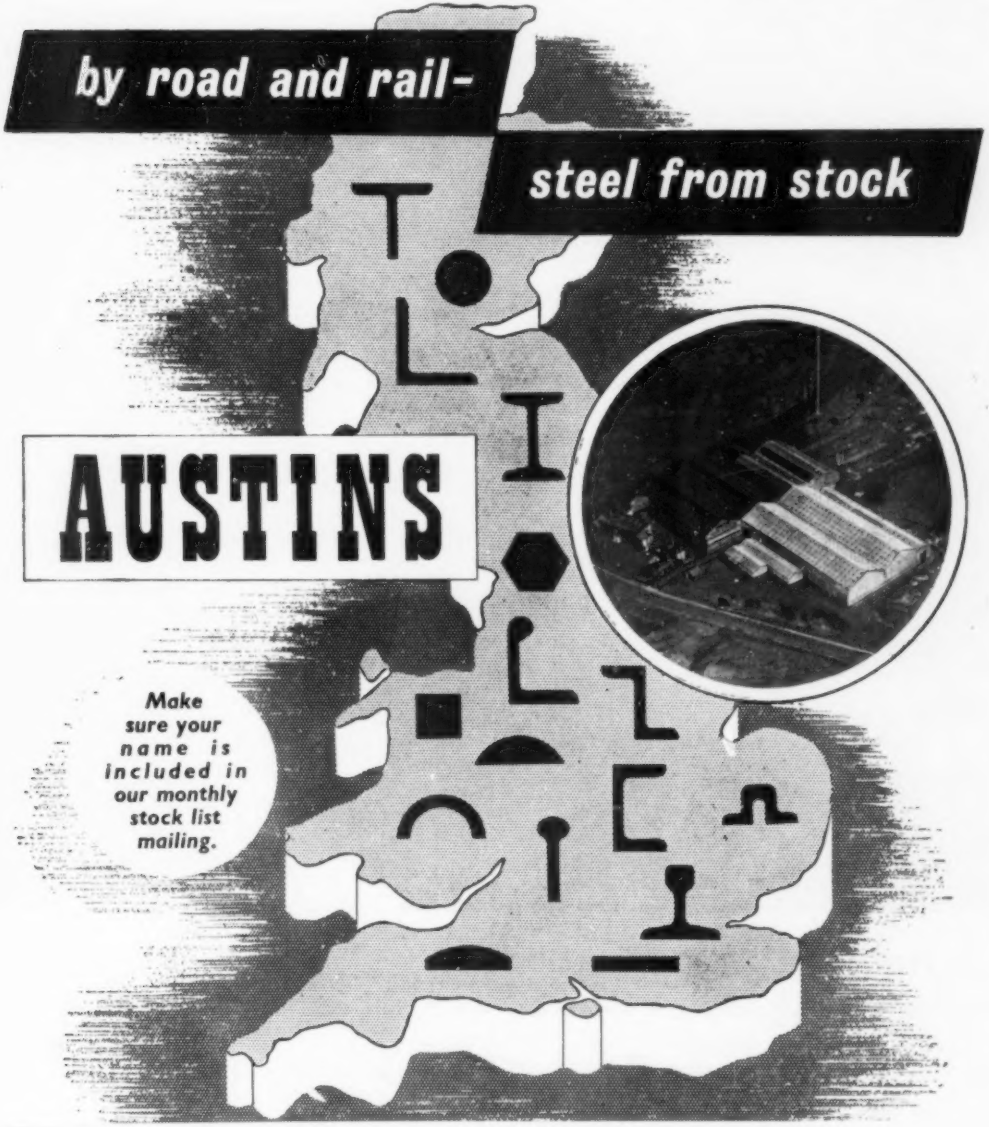

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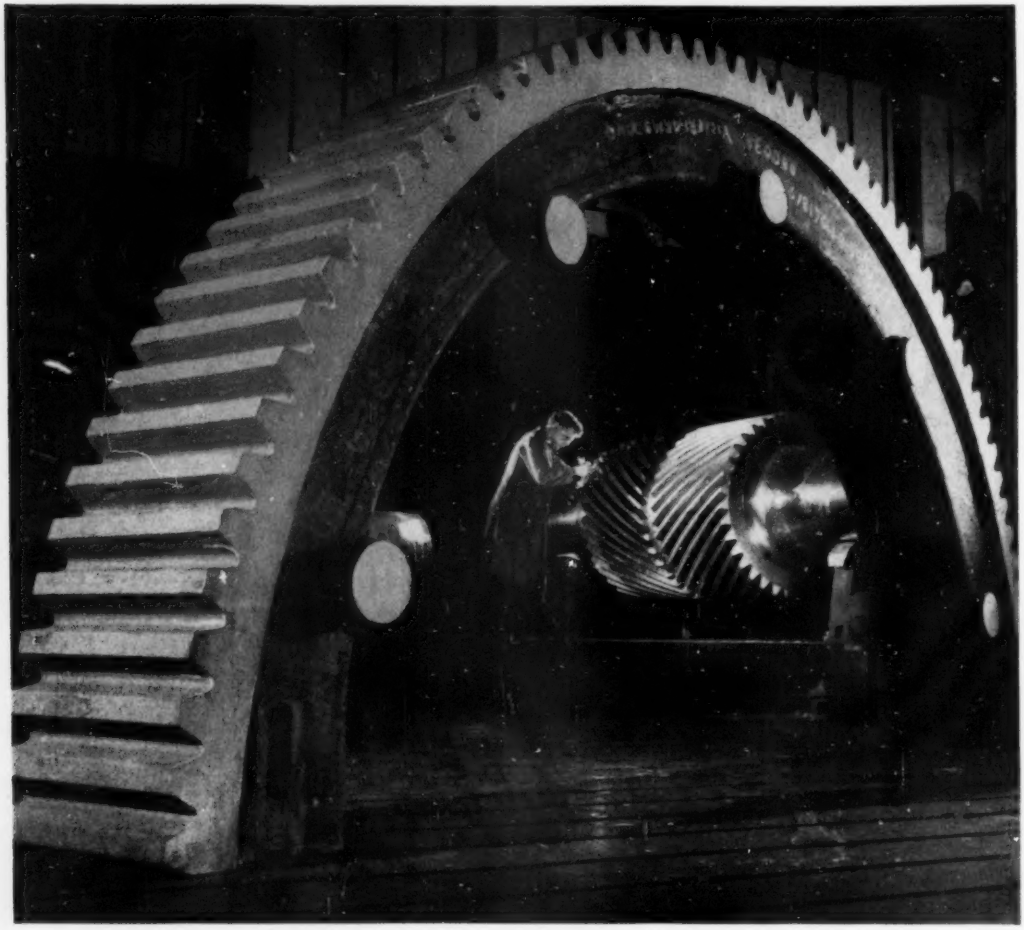

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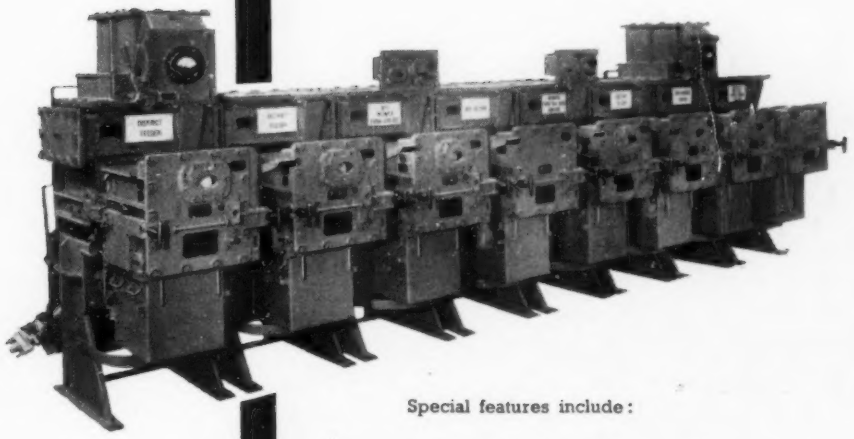

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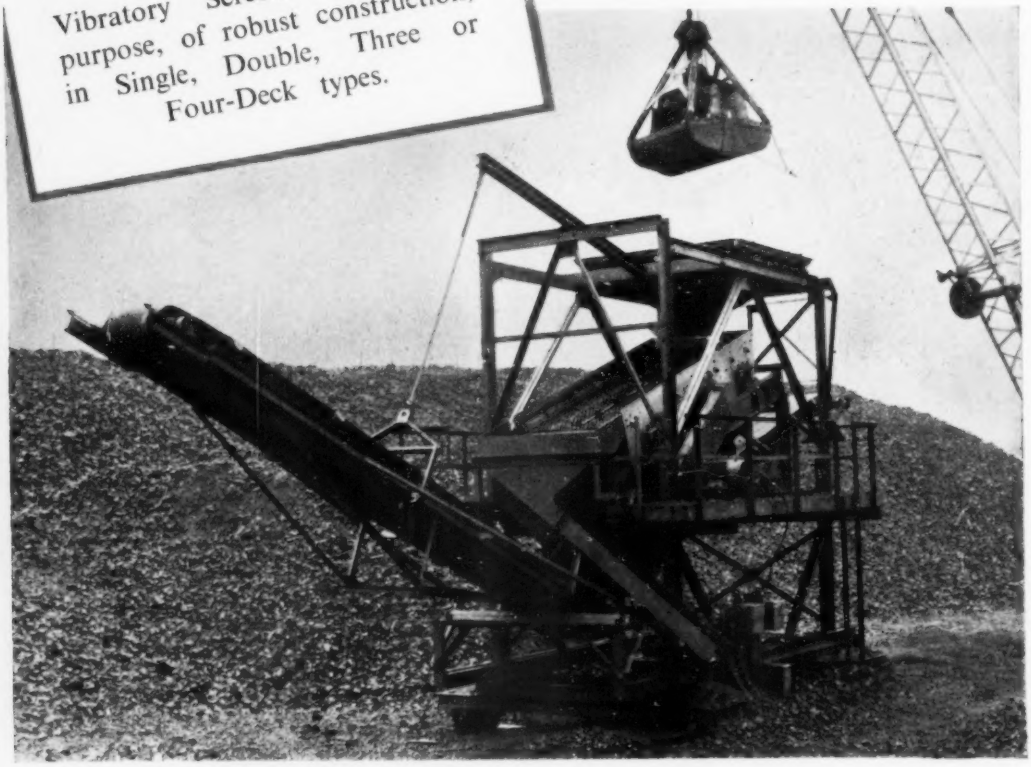

The above photograph, which is reproduced by permission of the N.C.B., illustrates a Portable Coke Screening Plant in use at the N.C.B. for dealing with 80/100 tons per hour of coke from a stock pile. The vibratory screen shown is one of our 12 ft. x 5 ft. two-deck types.

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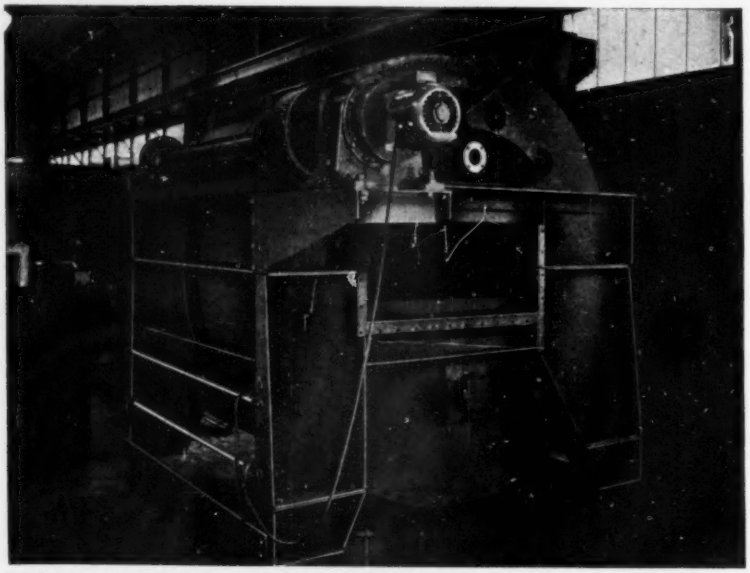

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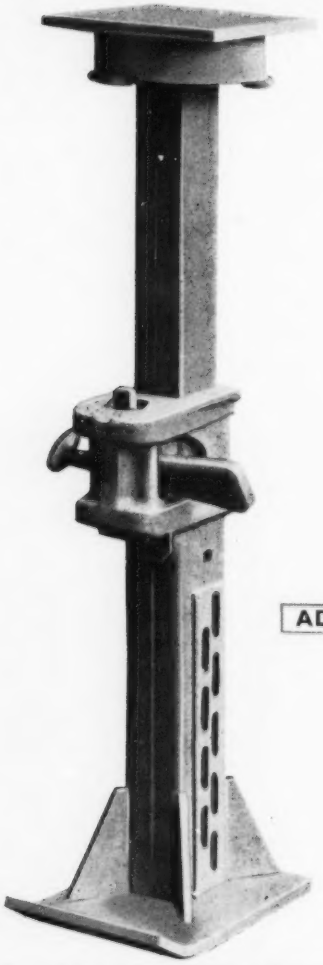

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Single clamping wedge.

Robust construction.

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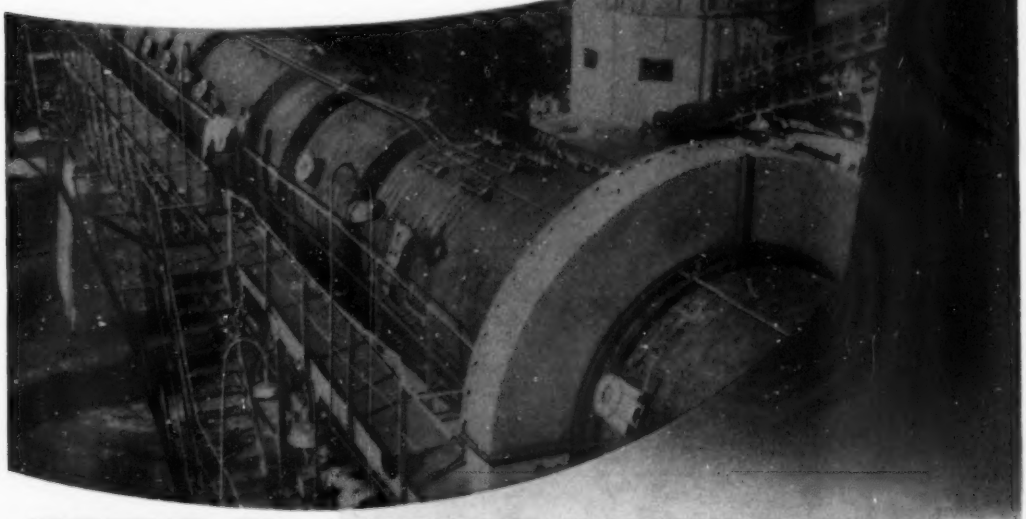

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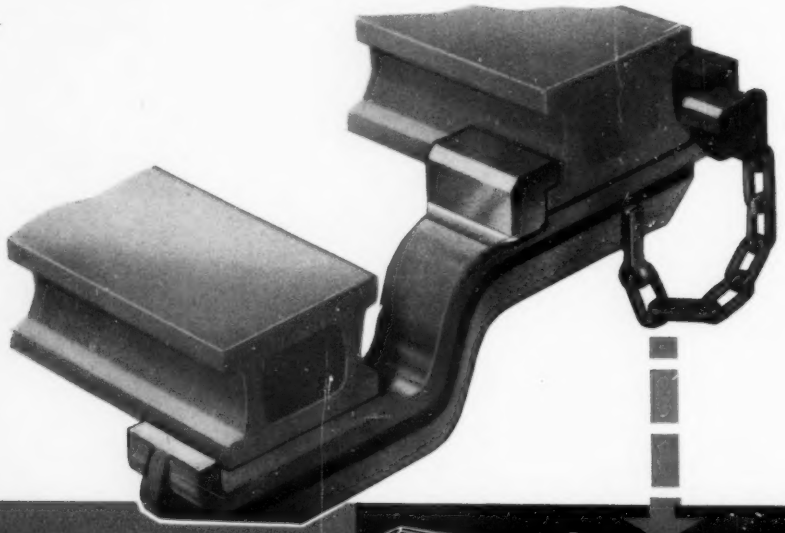

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reduces
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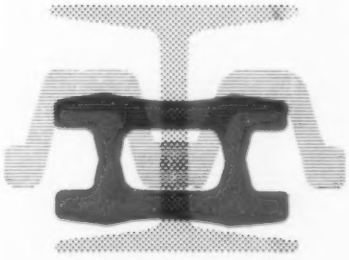

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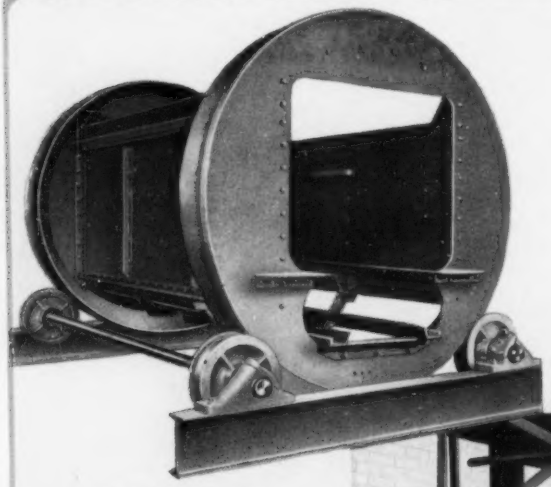

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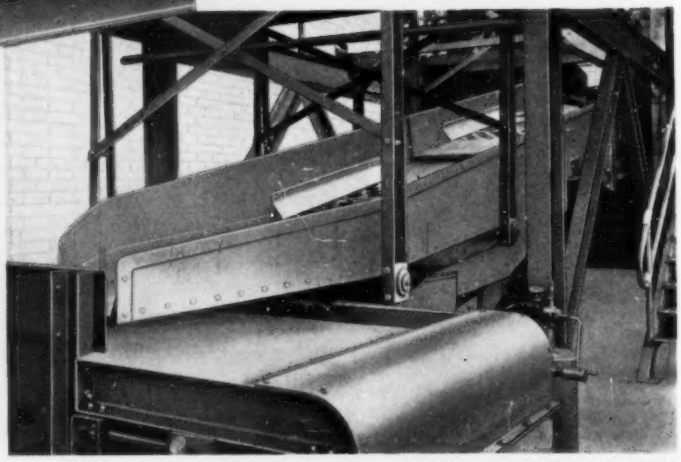

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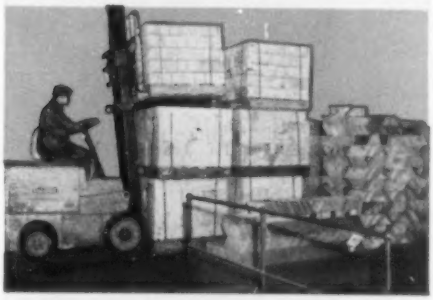
(Left) 14 cwt. capacity ingot mould. (Right) 20-ton capacity ingot mould.



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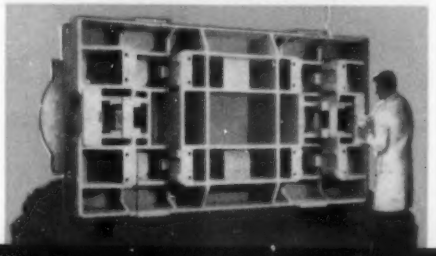
View of underside of 80-ton capacity ingot car supplied to Ebbw Vale Steel Works.



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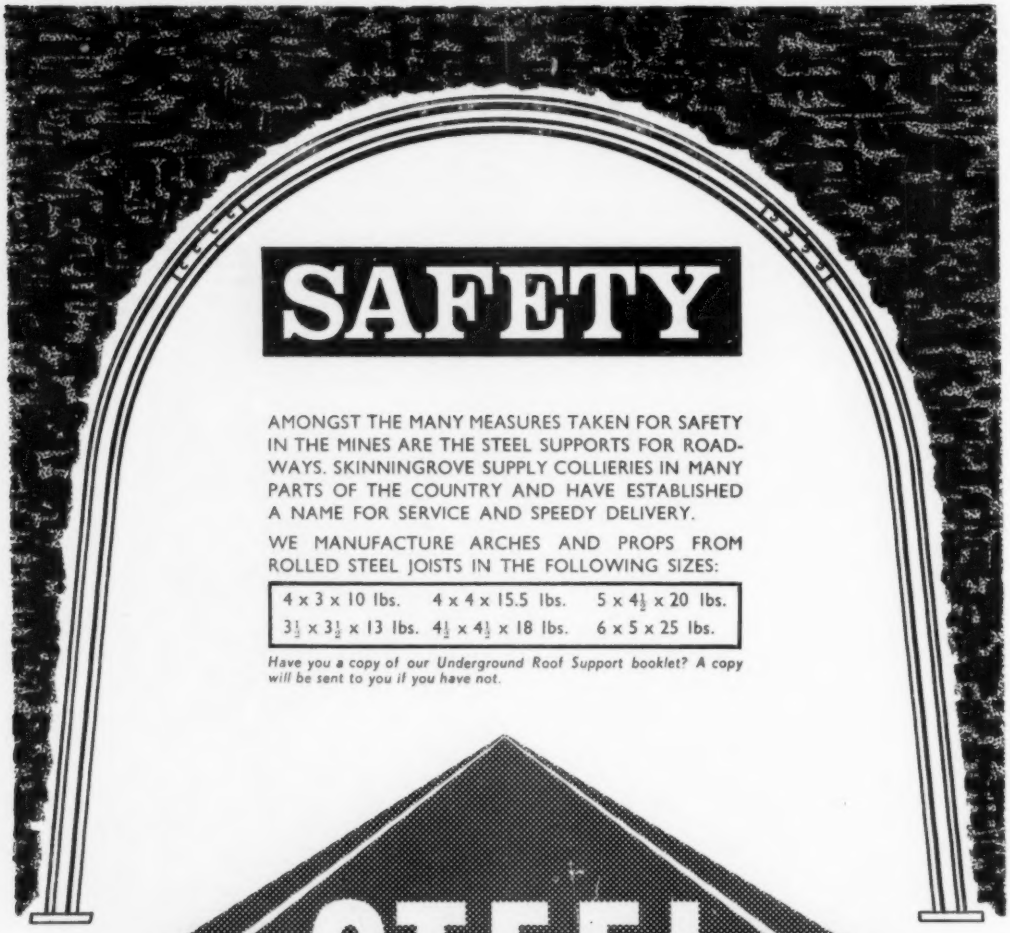

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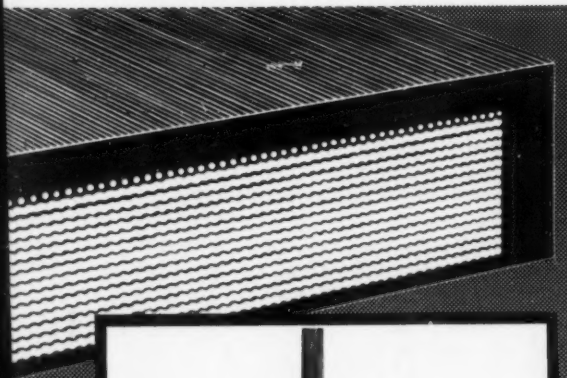
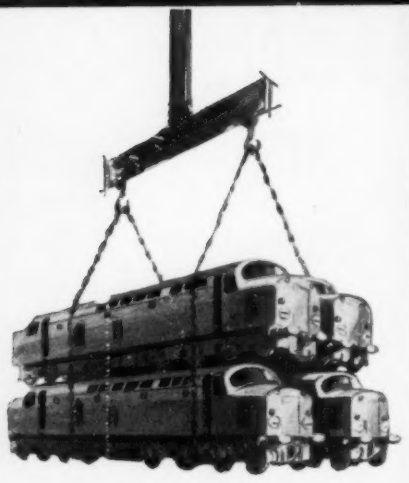
SOME OF THE STRONGEST

550 TONS



UP TO 1 1/8" THICK...

UP TO 14 PLY...



The U.S.S.R. have purchased from Dunlop 6½ miles (500 tons) of some of the strongest conveyor belting in the world! This belting is designed to operate in sub-zero temperatures and will be used for conveying ferrous and non-ferrous ores. Mine and quarry engineers everywhere acclaim the superior efficiency and reliability of Dunlop conveyor belting, and this latest order is further proof of world supremacy in design and manufacture.

This Dunlop belting owes its phenomenal strength to the special Dunlop design of fabric, incorporating man-made fibres, which is totally enclosed in a highly abrasive-resistant rubber compound.

HERE'S STRENGTH!

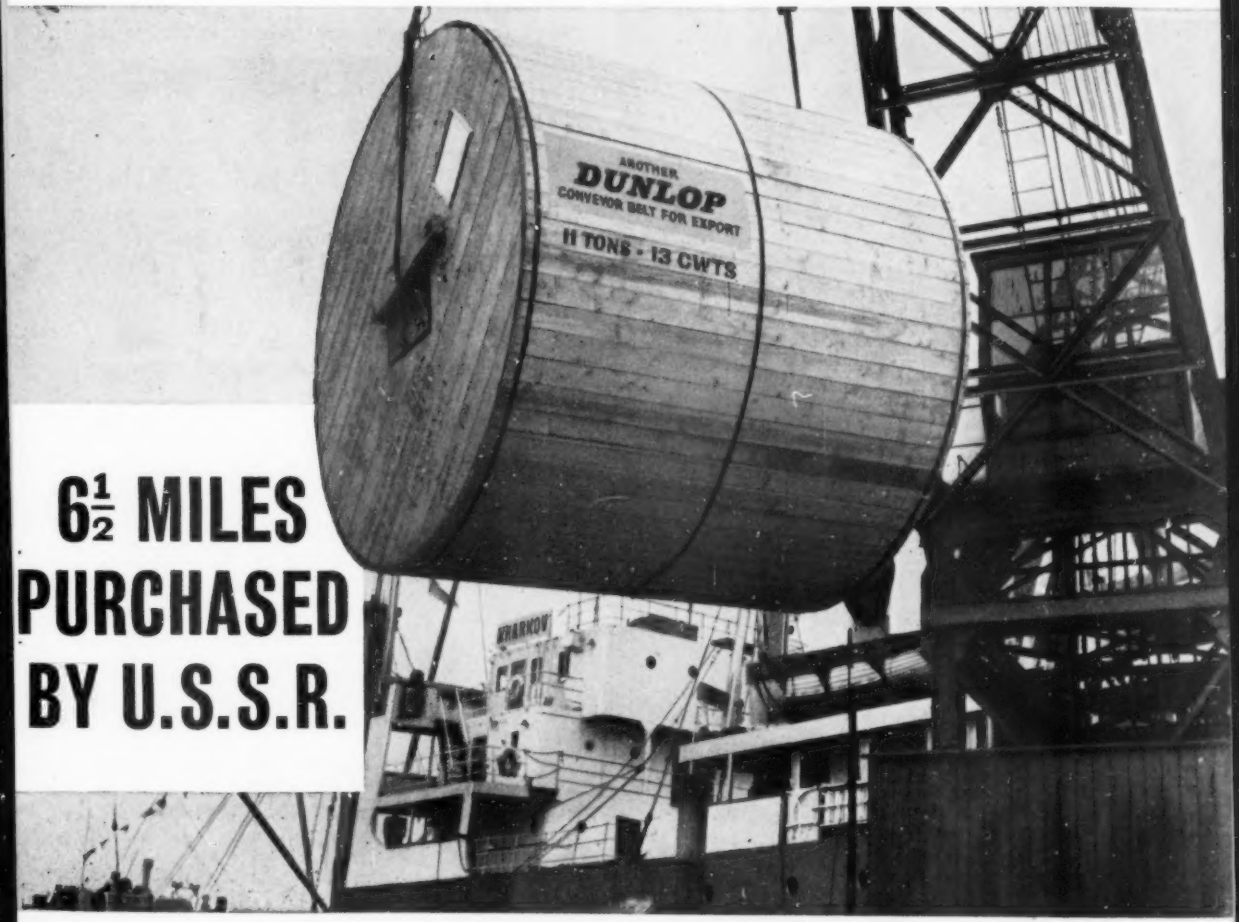
This special Dunlop belting could easily take the weight of four giant diesel railway locomotives!

DUNLOP

DUNLOP RUBBER COMPANY LIMITED (BELTING DIVISION),

CONVEYOR BELTING EVER MADE!

TENSILE STRENGTH



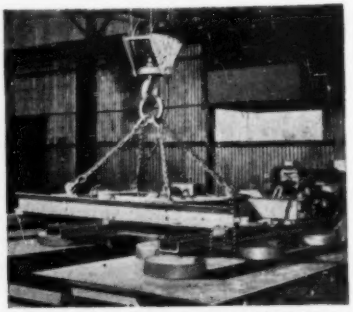
6½ MILES PURCHASED BY U.S.S.R.

CONVEYOR BELTING

PEKE, LIVERPOOL 24 · TELEPHONE: HUNTS CROSS 1850

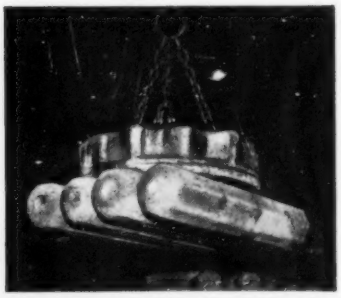
WITTON-KRAMER ELECTRIC MAGNETS

FOR ALL LIFTING PURPOSES



A group of lifting magnets at the Manor Works of Joseph Sankey & Sons handling plates for the magnet yoke of a 7000 MeV proton-synchrotron.

Lifting pig iron at Round Oak Steelworks Ltd.



Lifting four ingots at the works of Taylor Brothers & Co. Ltd., Trafford Park. The total lift is about 13,440 lbs.

There are Witton-Kramer lifting magnets of all types to help you reduce your handling costs. Modern design and robust construction ensure their long life under severe operating conditions. That is why so many are being supplied for such a variety of duties.

RELY ON THE EXPERIENCE OF G.E.C.

THE GENERAL ELECTRIC CO LTD OF ENGLAND · WITTON-KRAMER DIVISION · BIRMINGHAM 6

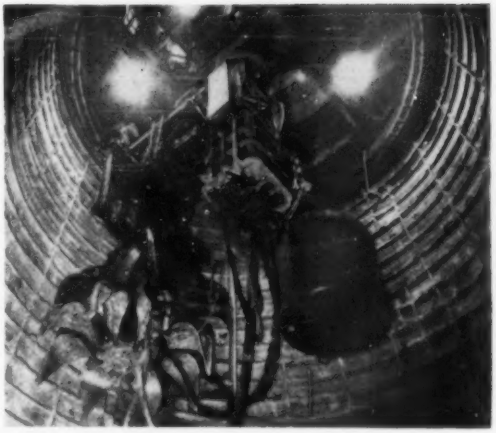
389

THYSSEN

SHAFT SINKING COMPANY LTD.

MINING AND CIVIL ENGINEERING CONTRACTORS
MINING CONSULTANTS

View from the Shaft Bottom, showing the underside of the Sinking Stage, 105 cubic feet capacity bowk and lashing gear, including grab and driver's cabin, etc., in use at Kellingley Colliery, Yorkshire, where we established the British Shaft Sinking Record of 339ft. of completed 24ft. internal diameter concrete lined shaft in January, 1961.



View of the Roadway at Blaengwrach (New Drift), South Wales where, in cross measure coal strata, we established the British Tunnelling Record of 108 yards advance in one week during February, 1961.

(Photographs by courtesy of the National Coal Board)

SHAFT SINKING, TUNNELLING, CEMENTATION, SPECIALISTS IN ALL TYPES OF UNDERGROUND DEVELOPMENT WORK

ALL TYPES OF CIVIL ENGINEERING WORK

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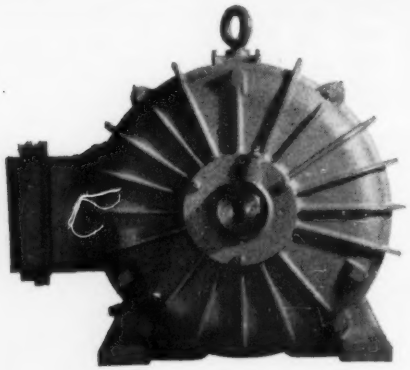
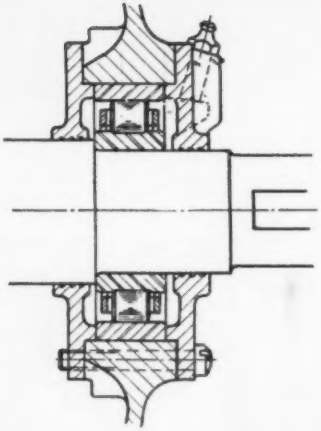
Registered Office : **3, Grosvenor Gardens, London, S.W.1.**



Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked; and a wider, vaguer, but essentially more realistic sense which covers freedom from trouble, ease of servicing, adaptability and many other things. Performance in the first sense is reproducible by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on know-how or experience.

This thing called know-how



Take for example bearings. We were amongst the first manufacturers to fit ball and roller bearings to electric motors and, in fact, they were standard equipment on our machines whilst the majority of motors still had sleeve bearings. The ubiquity of ball and roller bearings on motors today indicates how right this early choice was. There is a small but important detail in which the housings of the bearings on our motors differ from those on many others. We bore the end-shield clean through and fit two caps. The through bore allows of more accurate gauging—particularly with regard to parallelism—than a blind hole and the cost of the extra cap is in our opinion more than justified by this and by the better grease retention it makes possible.

Crompton Parkinson LIMITED

ELECTRICAL EQUIPMENT

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, B.E.T. Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

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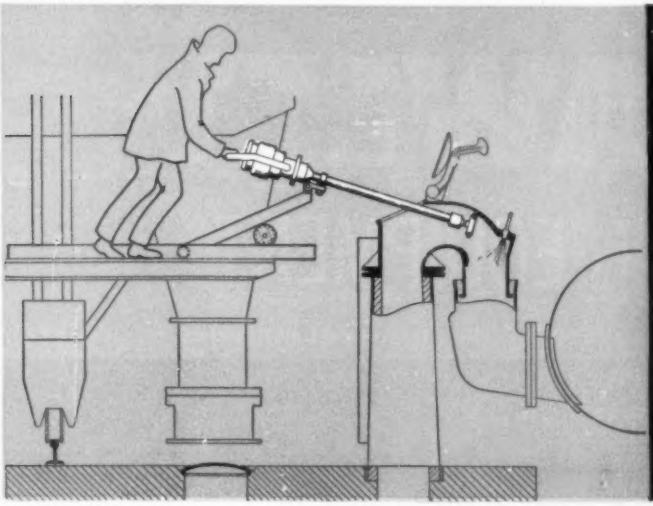
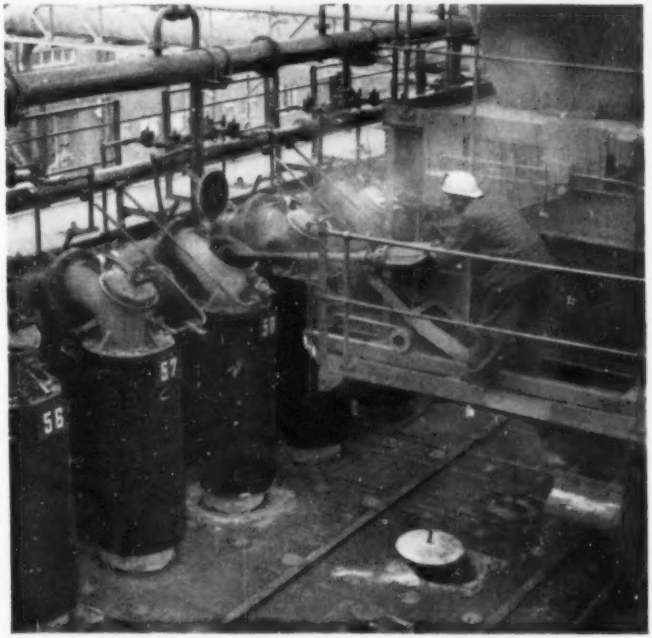
G612



for easy cleaning of ascension pipes

The W-D FLAIL CLEANER removes the drudgery from a coking plant chore.
Easy to use and efficient in operation— its regular use ensures clean ascension pipe bends.

The studded charging hole lids are lifted and replaced mechanically



U.K. Patent No. 854113

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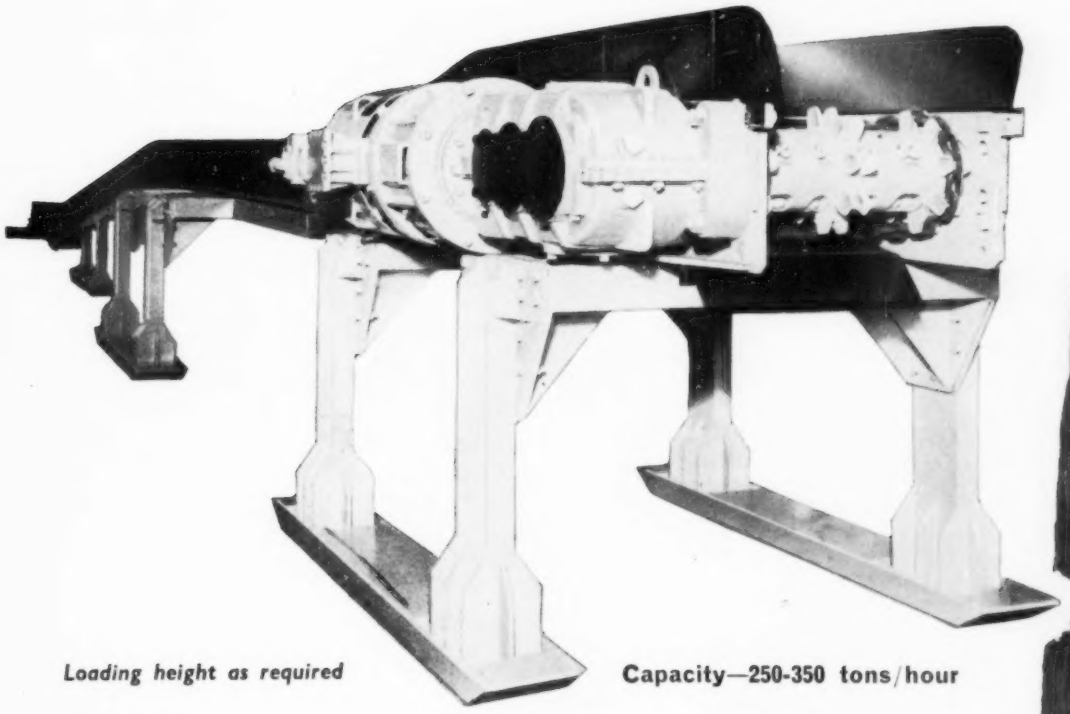
Crawley thin seam mining equipment includes:—

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
HEAVY DUTY SNAKING CONVEYORS · EXTENSIBLE STAGE LOADERS
STATIONARY BUNKER CONVEYORS · EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS

Write for **CRAWLEY** *"Mining Equipment" Catalogue NOW!*

THE **CRAWLEY** HEAVY DUTY SKID MOUNTED STAGE LOADER



Loading height as required

Capacity—250-350 tons/hour

Overall width—

Extra Heavy Duty Extensible Stage Loader, treble strand 18-mm. chain .. .. 30 in. & 36 in.
Heavy Duty Extensible Stage Loader, double strand 18-mm. chain .. .. 24½ in.
Lo-hite Extensible Stage Loader, double strand 13 or 14-mm. chain .. .. 24½ in., 30 in. & 36 in.

Designed basically to deal with the problem of extension of plate belt conveyors, so that the equipment gives the minimum coverage over the discharge unit, but is extensible by the addition of pans and chains up to an overall length of 150 yards, thus avoiding frequent and expensive extensions to the plate belt conveyor, and can be supplied with N.C.B. recommended drive frame and gear box at request.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

Drive Frame · Gear Box · Gear Assemblies · Extension Sections · Structure · Tail Unit · Chain Flights

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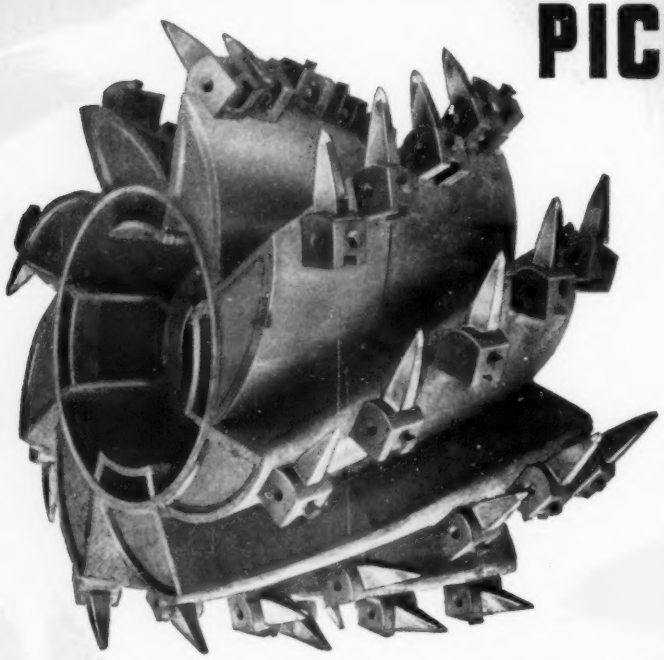
The HEELEY SHEAR DRUM *with* HIGHER SPEED METALS PICKS



★ FASTER HAULAGE SPEEDS
★ A MINERS PICK, MECHANISED
★ AMPERAGE DOWN
★ LARGER COAL
★ LESS RECIRCULATION
★ THE ONLY DRUM WITH PICK POINT ATTACK
★ A HIGHER PERCENTAGE OF COAL DEPOSITED ON CONVEYOR

A Product of the

HEELEY (MINING MACHINERY) CO LTD.
NUNNERY COLLIERY, WOODBOURN ROAD,
SHEFFIELD, 9

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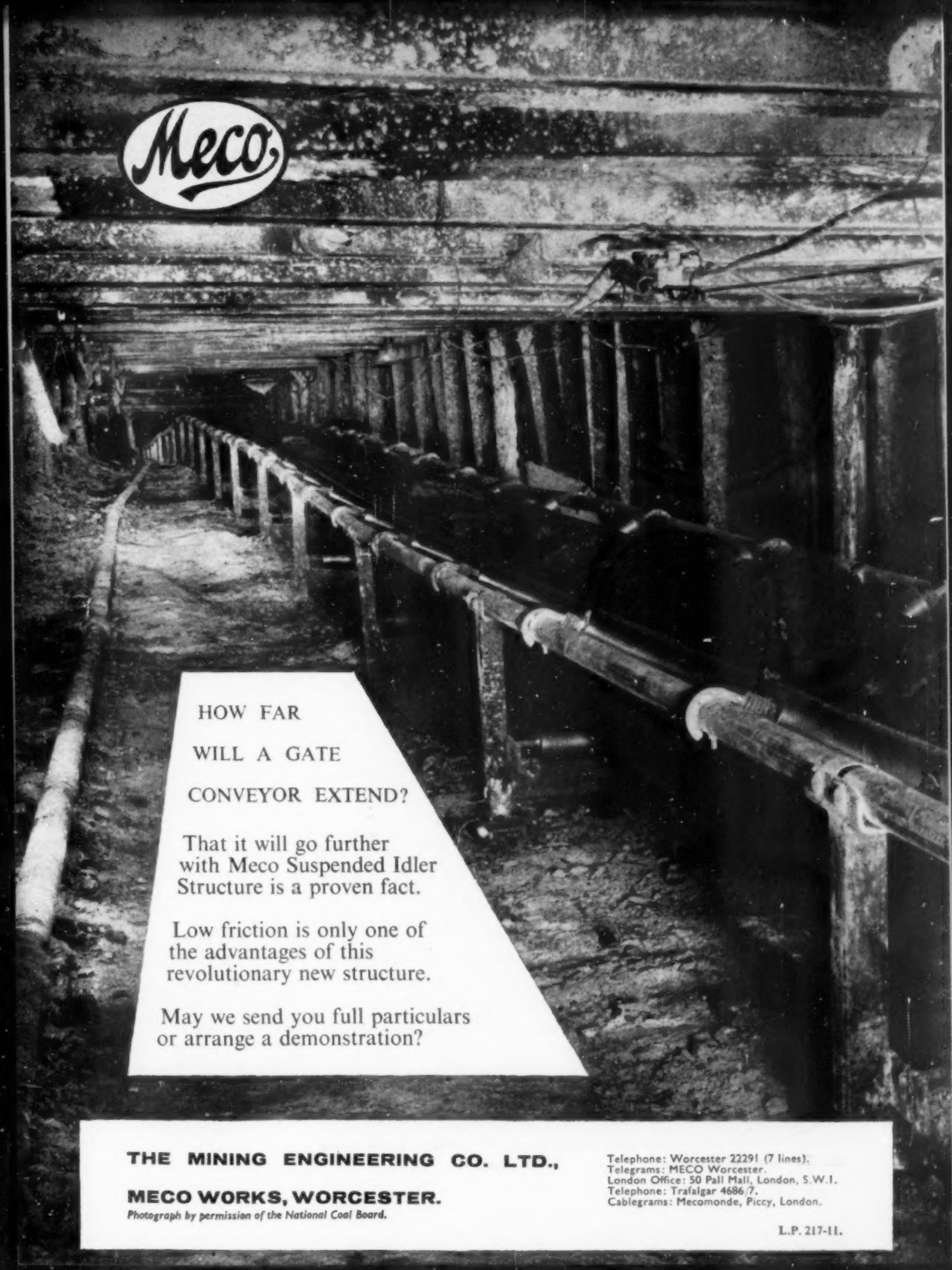
Meco
HOW FAR
WILL A GATE
CONVEYOR EXTEND?
That it will go further with Meco Suspended Idler Structure is a proven fact.
Low friction is only one of the advantages of this revolutionary new structure.
May we send you full particulars or arrange a demonstration?

THE MINING ENGINEERING CO. LTD.,

MECO WORKS, WORCESTER.

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L.P. 217-11.

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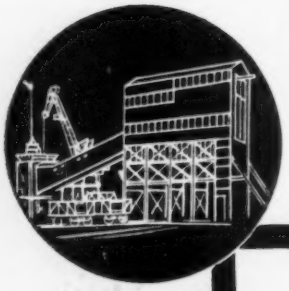
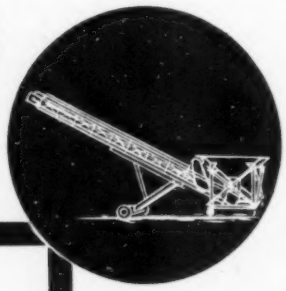
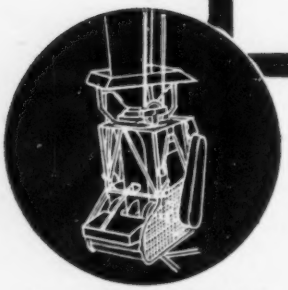


Coal Screening Plant

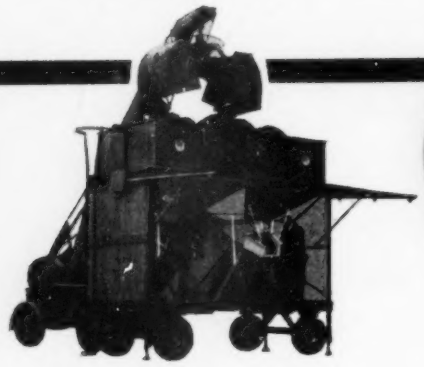
FOR ALL TYPES OF MECHANICAL HANDLING EQUIPMENT



Beaver (Bulk Stacker)



Meteor Thrower (Suspended)



A Crone & Taylor Bagging Unit

Bagging Unit

Unit Conveyor (Overhead)

A standard twin unit, with a capacity from 18 to 24 tons per hour 8" coal, or 10 to 14 tons per hour coke. The machine offers maximum storage with minimum floor space. The platform, which is at lorry height, is enclosed for all weather protection.

For particulars of Bagging Units contact :

CRONE & TAYLOR (Engineering) Ltd.,

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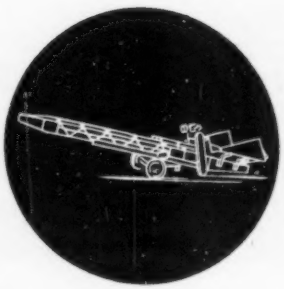

Walrus Stacker

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Sole Agents for the United Kingdom :

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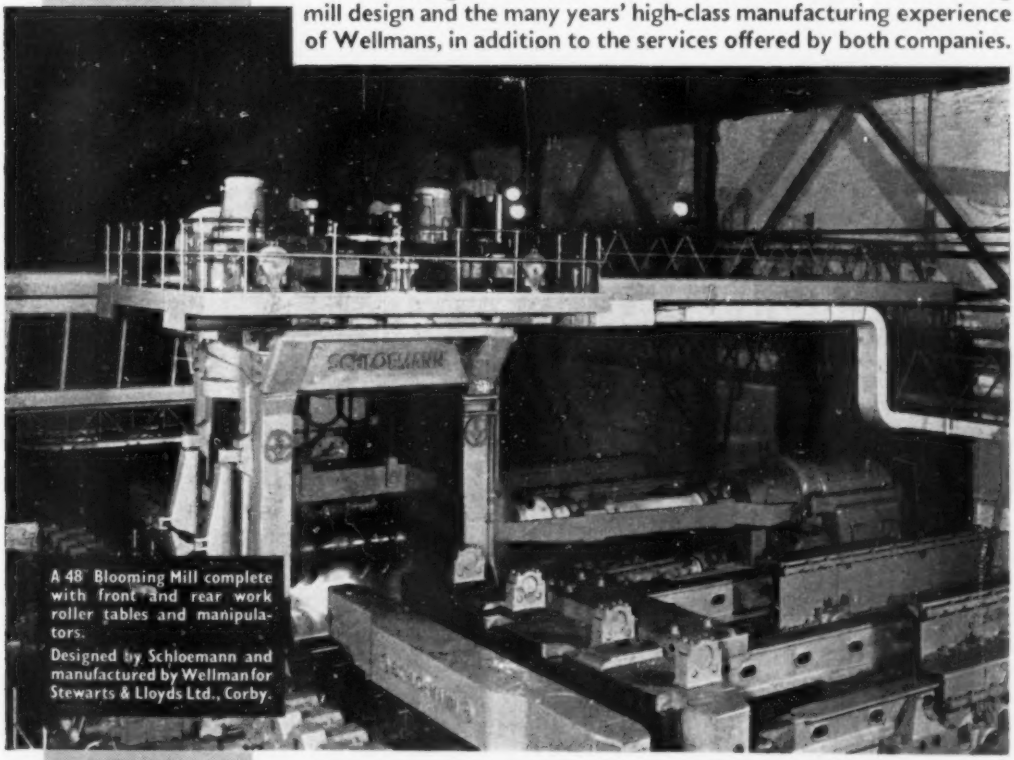
Schloemann AG., Düsseldorf, and The Wellman Smith Owen Engineering Corporation Ltd., London, have concluded an agreement, under the terms of which the two firms are to collaborate in the construction of hot and cold rolling mills, for ferrous and non-ferrous metals, in Britain and the Commonwealth countries. Steelworks in these territories will therefore be able to take advantage of Schloemann's advanced techniques in rolling mill design and the many years' high-class manufacturing experience of Wellmans, in addition to the services offered by both companies.



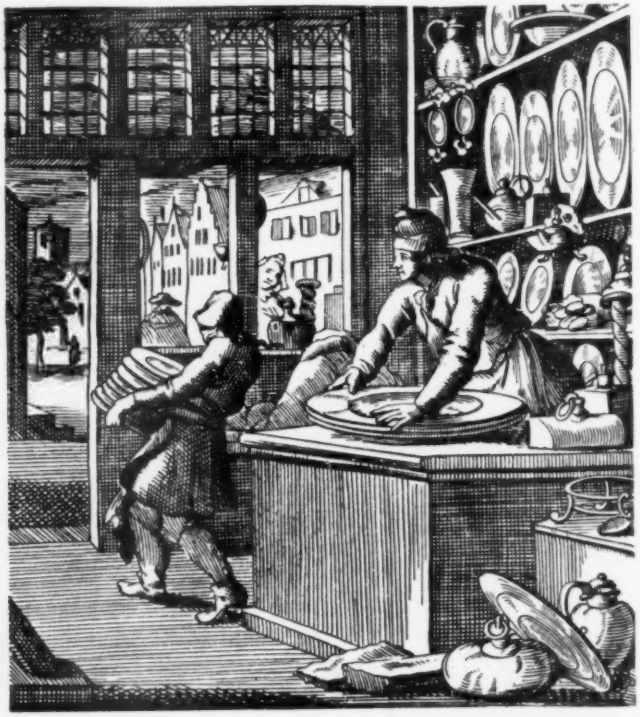
A 48" Blooming Mill complete with front and rear work roller tables and manipulators.
Designed by Schloemann and manufactured by Wellman for Stewarts & Lloyds Ltd., Corby.

WELLMAN

THE WELLMAN SMITH OWEN ENGINEERING CORPORATION LTD

PARNELL HOUSE, WILTON ROAD, LONDON, S.W.1 WORKS: DARLASTON, South Staffs. & BELFAST.

Reproduction of 16th century Dutch Print, illustrating the craft of the Tin-smith. (Copyright, Radio Times—Hulton Picture Library)



Every man to his own trade—

and our trade is STEEL!

Not only mild steel for everyday use but also the special steels demanded by the Nuclear Age . . . Consett nuclear steels were selected for use in the British Nuclear Plants at Bradwell, Chapel Cross, Calderhall, and now Dungeness, as well as the new Italian plant at Latina.

An interesting booklet "Steels for the Job", just published by us, describes some of our newer products. We shall be delighted to send you a copy. Our Technical and Research Department will also welcome enquiries from any whose problem is . . . **STEEL**

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A GAS PRODUCER PLANT IN 7½ MONTHS!

In November 1959 the National Coal Board asked us to build a complete gas producer installation at Manvers Main as quickly as we could. Site work started in December and in August 1960, only 7½ months later, the first producer was put on load.

The gas was urgently required for firing the ovens of the Manvers batteries so that rich gas, which had previously been used for this purpose, could be liberated for sale to the East Midlands Gas Board.

Thanks are due to the N.C.B. for their enthusiastic co-operation in this outstanding achievement.

Photo by courtesy of N.C.B.

COMPLETE GAS PRODUCER PLANTS BY

Simon-Carves Ltd

CHEADLE HEATH · STOCKPORT

CS243

THE STANTON IRONWORKS COMPANY LIMITED

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commencing 1st July, 1961

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PIG IRON
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CARBONS UP TO 1.0%
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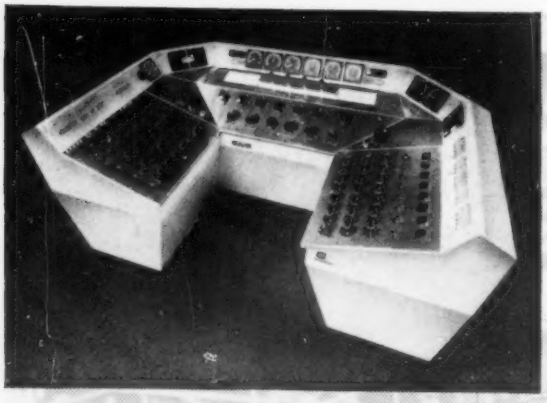
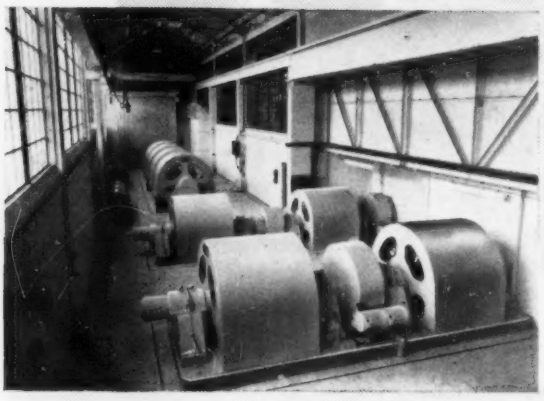




Motors · M-G Sets

Rectifiers

Electronic Controls

Programming

Optimisation

Automatic Gauge Control

for

ROLLING

BRUCE PEEBLES & CO LIMITED EDINBURGH / REGA BRUCKER & CO SIEGBURG GERMANY

Hand in Hand . . . An Agreement has been concluded

between Bruce Peebles & Co. Limited, of Edinburgh, and REGA Brucker & Co., of Siegburg, Germany, for the joint production and marketing of complete electrical equipments for the operation and control of ferrous and non-ferrous hot and cold rolling mills. This agreement unites in this field the resources of these two well-known organizations, each of which has had extensive experience in the design and manufacture of electrical equipment incorporating the most advanced techniques in the specialised rolling field.

Under the arrangements made in the agreement, which covers the supply of equipment in the whole of the United Kingdom and in Eire, rotating machines and rectifiers will be built by Bruce Peebles, and the electronic controls, programming, optimisation, and automatic gauge control equipment will be designed by REGA Brucker and manufactured either by them, or, under licence, by Bruce Peebles.

Among the activities already in progress are contracts entailing full responsibility for the complete electrical equipment for several rolling mills.

MILLS

BRUCE PEEBLES EDINBURGH

REGA

Cardiff Office: Park Chambers, Park Place

LATEST TEST RESULTS

ON 25th May 1961 a mechanically applied Hayden-Nilos Premium belt joint was certified by an independent test authority as having achieved a tensile strength 320% higher than the previous best of any mechanical belt joint.

See later editions for more news of this major breakthrough.

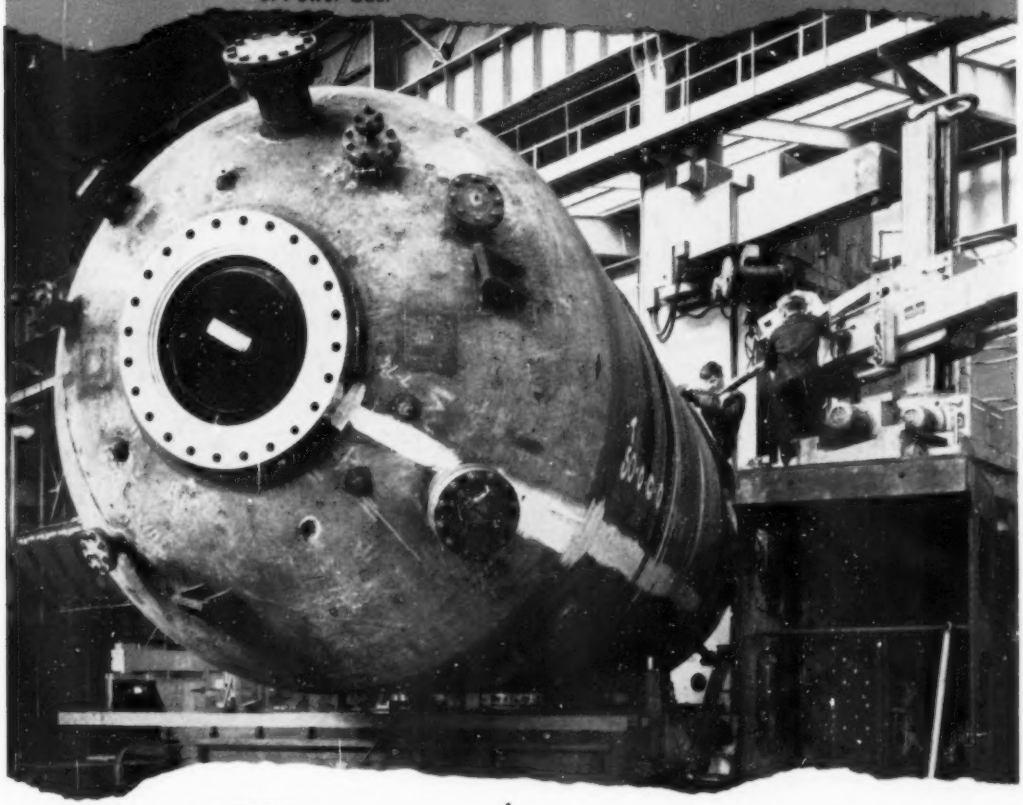
HAYDEN-NILOS LIMITED SHEFFIELD

HNH601

LURGI HIGH PRESSURE GASIFICATION VESSEL

MADE IN THE UNITED KINGDOM

Illustrated below is the shell of the first Lurgi gasifier to be made in the United Kingdom, supplied by The Power-Gas Corporation Limited to the order of Humphreys & Glasgow Limited. The shell together with coolers, waste heat boilers and other equipment, for the Lurgi gas-making plant at Westfield, Fife, were manufactured in the Stockton Works of Ashmore, Benson, Pease & Company Limited, a sister company of Power-Gas.



POWER-GAS | DAVY-ASHMORE GROUP

THE POWER-GAS CORPORATION LIMITED · STOCKTON-ON-TEES

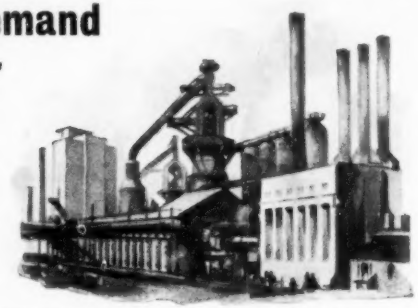
LONDON · SHEFFIELD · GLASGOW · MIDDLESBROUGH · HULL · PARIS · MONTREAL · MELBOURNE · SYDNEY · JOHANNESBURG · SALISBURY · CALCUTTA · BOMBAY

516

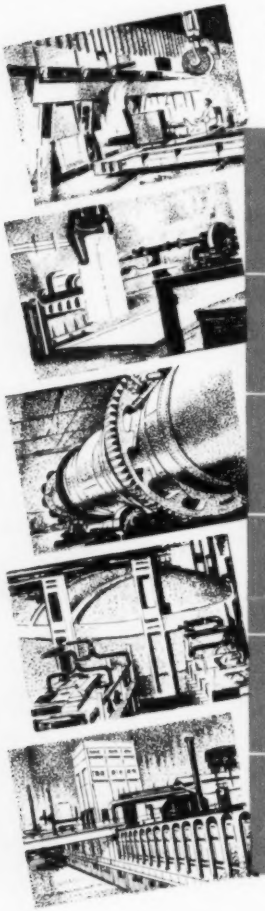
New Industrial Developments demand

STEETLEY

REFRACTORY PRODUCTS



With their intensive research and development the Steetley Group of Companies has been a significant factor in producing new and better refractories to meet the increasingly rigid demands of industry in their race against international competition. Steetley research is constantly broadening and is destined to make important contributions to refractories progress.



INDUSTRY		PRODUCTS	TRADE NAMES
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In this Issue—

BRITAIN'S FIRST LURGI GASIFIER
Westfield Plant Opened by the Queen - - - page 1385

HYDROGEN IN BASIC O-H STEELMAKING
Influence of Gas and Tar Oil Firing - - - - page 1389

THE COAL INDUSTRY TODAY
The Test for Management - - - - - page 1401

TWO CONTEMPORARIES OF BESSEMER
David Mushet and William Kelly - - - - page 1409

COLLIERY MANAGERS' EXAMINATIONS
Text of the Papers - - - - - - - - page 1413

	PAGE
Leading Article: Selling in Depth	1375
Passing Thoughts	1376
"Costly Steel Delays"	1377
Better Sales Outlook for Metal Box	1377
Personal	1378
"Cancel NCB Debt"	1379
Appointments	1380
Head of New Technical Aid Department	1380
Higher Costs Again	1381
Hot Dip Galvanizing Plant for SCOW	1381
Lower Half-year Trading Profits by Dorman Long	1381
Law Cases	1382
Company News	1383
Board Changes	1384
Electronic Telecontrol Equipment	1388
Steel House, Eastcote	1399
Open-cast Coal Mining in Canada	1400
South Staffs Branch, NACM, Annual Meeting	1407
Floodlighting at Marshalling Yards	1407
Forthcoming Events	1407
Sandvik's New Research Laboratories	1408
Cathodic Protection	1408
Technical Data on Constructional Alloy Steels	1410
New Patents	1411
Lord Mills to Open New Welding Research Laboratory	1412
Nigeria's Potential for Steel Industry	1412
Port Kembla's 550-ton Open-hearth Furnace	1412
New Literature	1417
Australian Scrap Export Quotas Unchanged	1417
New Company to Market Process Control Systems	1418
New London Showroom for G. A. Harvey	1418
Park Gate Iron & Steel to Minimize Smoke and Dust	1418
African Notes	1419
Orders Placed	1420
Fletchers Return to Mining Industry	1420
Cheap US Coal	1421
Phenomenal Rise in US Energy Requirements	1421
Obituary	1422
"Vital Need" of Automation in British Industry	1422
Iron and Steel Trade	1423
Spectrometer Equipment for Material Analysis	1423
New Wire Rope Depot for Martin, Black	1423
Coalfield News	1424
The Coal Trade	1425
Holidays Affect Coal Output	1425
News in Brief	1426
Higher Group Profit for F. H. Lloyd	1426
In Parliament	1427
Coal Chartering	1427
Exports of British Coal	1428
Exports of Coke and Patent Fuel	1428
Imports and Exports of Mining Machinery	1428
Rise in Coal Exports if UK Joins Common Market	1428
Imports and Exports of Iron and Steel	1430

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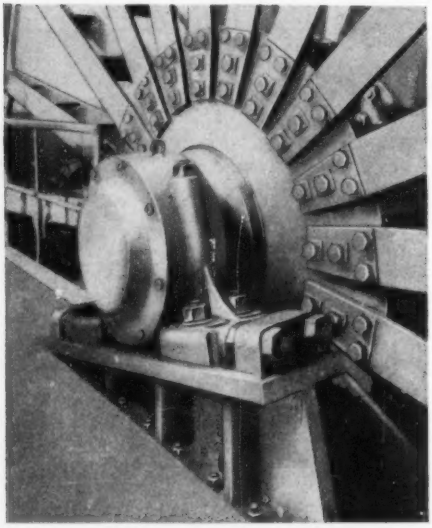

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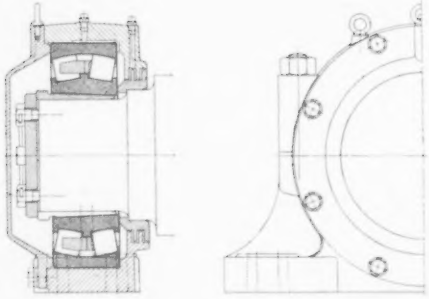

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 182 June 30, 1961 No. 4,850

Selling in Depth

TO the Doubting Thomases who are abroad in the steel industry today, mouthing queries born of their own pessimism, we suggest a reading of the address given by Mr. Roger M. Blough to the annual meeting of the stockholders of the United States Steel Corporation. It is no business of the head of any enterprise to exude undue optimism or indulge in pessimism when addressing his shareholders. His job is to present the facts and give a reasoned exposition of the future as he sees it. The chairman of US Steel had to report that in 1960 the corporation's operations, as measured by the production of ingots, swung from very high to very low. Sales and income were up, and the percentage return on sales was higher than in 1959, but the records of 1960 showed a wide range of activity in the rate of operations, and the first quarter of 1961 witnessed a sharp drop in production. Mr. Blough saw in the immediate outlook a number of encouraging elements, and his view of the near future is perhaps best described as one of restrained optimism. Looking farther forward, he is certainly no prophet of woe.

"The potential demand and world market for steel is virtually unlimited," says Mr. Blough. World trade in steel has moved to a new peak, but there are still great years ahead for world steel production and sales. While recognizing that the world-wide growth in steel production presents an inevitable competitive challenge to steel producers everywhere, the chairman of US Steel points out that it also indicates—by the mere fact that it is taking place—that increased opportunities for steel are also certain to accompany greater industrialization, particularly as the revolution in technology, the explosion of population, and the expectations of peoples in Asia, Africa, and Latin America continue at an accelerated rate. In most countries of the world *per capita* consumption of steel mill products is lower than it is in the United States. In some countries it is very much lower, large segments of the world's population having available, according to Mr. Blough, as little as 20 lb. of steel per person per year, compared with an average per person in the United States of over 1,200 lb. annually. "Almost three quarters of the world's people now urgently want the modern cities, automobiles, farm implements, sky-scrapers, and shopping centres that are but a few of the innumerable things in an industrial society requiring a background of steel."

Mr. Blough does not allow himself to be fascinated by the prospect of new peaks for steel. He deludes neither himself nor his stockholders. "If US Steel is to capitalize on this potential we must obviously be competitive, for we must bid for business against all steel producers, including those in foreign countries who are rapidly building their capacity for their own markets and for participation also in expanding world trade." Concurrently with continuous efforts to reduce costs and improve quality, he urges the need to create new products and find fresh applications for steel. Mr. Blough lists some of the successes US Steel has already achieved. The corporation is building an experimental blast furnace which will accurately duplicate all phases of blast-furnace operation and help its technicians to study, in a way never before possible, the complex reactions that take place inside the furnace. The objective is to find means of improving the efficiency of the blast furnace, and so to reduce costs. In the open-hearth shops, heat times of less than five hours have been experimentally achieved against a current average of around nine hours. A new six-stand cold-reduction mill the corporation is building will have a speed three times greater than that of the mills it replaces.

These are projects designed to cut costs and improve the quality of the products. In the steel promotion field, US Steel has developed a new, thinner tinplate to meet the competition of aluminium, glass, paper, and plastics as containers; for the enamelling industry and home appliance field, a new open-coil annealing process has been developed which permits enamelling in a one-coat process; a new structural carbon steel with a minimum yield point of 36,000 lb./sq. in. has been produced; a new steel for transporting liquid methane in tanks has created a market which would have gone to other materials.

Mr. Blough calls this "Selling in Depth." Among others, he puts forward these ideas:—To design in steel the new shapes and forms of transportation of the future, and to redesign present automobile frames and trucks using high-strength steels in order to reduce weight; to design more steel into modern homes and into commercial building construction; to design and build bridges utilizing stronger, lighter steels; to design lighter, modern office furniture of steel; to design covered hopper cars of stainless steel for the transport of bulk foodstuffs and corrosive chemicals, and to design railroad cars of steel for transporting automobiles.

Discounting the inevitable peaks and valleys,

the steel production curve has moved ever upwards for the last 20 or more years. We have never had enough steel overall. The curve is expected to go on rising and new capacity is being provided to ensure that it can rise. Meanwhile, production of other materials which compete with steel in various fields is rising also. It would seem that the time is coming, if it is not already here, when steel manufacturers in this and other countries will need to devote much more attention to developing new uses and new markets for steel than they have found necessary in the past. To "Sell in Depth," as Mr. Blough puts it.

Queen Opens Lurgi Gasification Plant

THE QUEEN, opening the Lurgi gasification plant at Westfield (Fife), on Tuesday said: "When in full production it will supply nearly one fifth of all the gas used in Scotland and, what is an important consideration, this great amount of energy will be distributed by high-pressure pipelines, thus adding nothing to the congestion of the roads and detracting but little from the beauties of the countryside." She was received by the Minister of Power (Mr. Richard Wood) and unveiled a commemorative plaque.

After the ceremony the Queen, accompanied by the Duke of Edinburgh, toured the plant. Later, wearing a white coat over her silk dress, a white headscarf, and carrying a white protective helmet she drove six miles to see the Westfield open-cast coal site. While she inspected the giant spreader, climbing up into its cabin to watch the machine spreading the overburden over the waste fields, the Duke visited the stone crushers.

A full description of the Lurgi plant is given on page 1385.

"BLAST OF COMPETITION" ON COAL

COAL industry is now "wide open to the blast of competition, and it is the best thing that has happened to us," Mr. Clifford Machin, production director for the North-Eastern Division of the National Coal Board, told the Nottinghamshire Mining Students' Association's Worksop branch last Friday.

He considered the NCB could beat the threat from the oil industry, which he was sure had troubles of its own. "Oil costs will go up, but our costs are bound to come down. We have coal on our doorstep."

Mr. Machin was deputizing for Mr. W. H. Sales, chairman of the division, who was indisposed.

RANSOME & MARLES BEARING COMPANY, LIMITED, manufacturers of ball and roller bearings and line-shafting equipment, of Newark (Notts)—The company announces that underwriting is in progress for an issue to shareholders of 2,000,000 ordinary 5s. shares at 13s. 6d. a share in the ratio of one-for-six shares held on June 10.

Passing Thoughts . . .

OVERSEAS importers are people, not merely names on letterheads. It is of paramount importance that they be met personally and talked into a harmoniously working partnership. Starting with top management, therefore, exporters must visit the people who buy their goods. By the same token, be it in technical literature or in consumer hand-outs, it is not possible to get selling points across in a language which is not understood.—MR. W. R. MILLS, general sales manager, Stanley Works (Great Britain), Limited, in a letter to the Financial Times.

> *We are always being exhorted, cajoled, and castigated in regard to our exports, but I think that on the whole British industry is alive to the export opportunity provided the right conditions can be created.*—MR. NIALL MACPHERSON, *Parliamentary Secretary to the Board of Trade.*

Last year 60 per cent. of the time lost through strikes occurred in four industries only:—Motor manufacturing, docks, shipping, and coal mining. Yet these industries between them employ only 7 per cent. of the working population. The clear truth is that these troubles do not occur where managements over the years have made it part of their company policy to build up understanding and trust with their employers. —MR. JOHN HARE, Minister of Labour.

> *I strongly suspect that we are carrying a higher proportion of passengers in the more senior managerial positions than we realise.*—MR. J. E. V. TYZACK, *management consultant, speaking to the Institute of Directors' conference on the Problem of Retirement.*

A furnace worker will usually sweat four to five pints daily and probably more in hot weather. This works out at a loss of about a level dessertspoonful of salt daily. Unless this salt is replaced, it will lead to early fatigue and eventually painful cramps.—DR. B. P. R. HARTLEY, works medical officer at Samuel Fox & Company, Limited, branch of the United Steel Companies, Limited, writing in Safety, the magazine of the British Iron and Steel Federation.

> *There can be small hope of increasing coal exports while American coal can be supplied to "Continental coastal works" 18s. a ton cheaper than can British coal to British coastal works.*—*Sheffield Telegraph.*

Perhaps few people ever really believe that their personal slice of the cake of jointly earned profit is big enough, but the motor industry has provided fairly fat slices all round. It is a modern industry, and working conditions generally are good. Yet its labour relations seem as backward as those between nineteenth-century coal owners and miners.—The Guardian.

Anthracite from South Wales Open-cast Sites

DETAILS of plans for large-scale open-cast mining in the Gwendraeth Valley and Ammanford areas of South Wales were disclosed at a meeting of Llanelly Rural District Council last week.

It was stated that it is proposed to mine 300,000 tons of anthracite at Penybanc, Ammanford; 125,000 tons on a site between Ponthenry and Pontyberem; 45,000 tons at Pontnewydd, and 27,000 tons at Pontyates. It is planned to take the coal by road to the Coedbach disposal centre at Trimsaran, near Llanelly.

"Costly Steel Delays"

WARNING BY CHAIRMAN OF HEAD WRIGHTSON

WHILE deliveries of steel, particularly special steels, may lead to "costly delays" in the next few months, the current year is expected to be one of great activity for Head, Wrightson & Company, Limited, says Sir John Wrightson, chairman, in his statement to shareholders. Profit margins both at home and oversea are lower than the group is accustomed to, and this tendency persists, he states, but the directors are constantly examining costs of manufacture and improving techniques, and the capital expenditure over the past few years is now beginning to show results.

Sir John says that it was in view of the satisfactory conditions of the works and the present market prospects that the distribution of a higher proportion of earnings was felt justified for the year to January 31, 1961. As previously reported, the dividend was raised from 14 per cent. to 16 per cent. Group profits before tax were £1,460,003 (£1,432,338).

SIR JOHN WRIGHTSON

Demand for most products was buoyant, says Sir John, but some sections of the business had a disappointing year. At home, the year was one of intense activity in the foundries and drop forges. In spite of the recession in the car industry, the tonnage of drop forgings delivered was increased, and the group is now engaged in building up a healthy order-book of direct export work in Europe.

Shortage of Material

Reviewing the activities of the various subsidiaries and associated companies, Sir John says that Head Wrightson Teesdale, Limited, and Head Wrightson Stockton, Limited, were both affected by the difficulty of obtaining requirements of steel to match growing order-books. This situation had not yet been corrected, and in the case of both these companies the works were not able to effect delivery of considerable tonnages of plant and equipment due to shortage of critical material.

Dealing with exports, the chairman says that during the year deliveries of plant and machinery for abroad continued in a substantial way. "We could not hope to repeat every year our intake of export orders at the previous rate. We have in fact this year shared the experience of Great Britain in general where we would normally wish to rise above the average. Great efforts have been made by the Head Wrightson Export Company into the search for new markets and new projects overseas."

Stating that the division of the European market into separate camps is becoming more and more evident as the pattern of the two rival trading groups becomes more set, Sir John goes on: "As British makers of specialized heavy plant we are finding ourselves at a disadvantage in the European Common Market with its dynamic record of growth and, although we are pursuing our drive for exports within the European Free Trade Area, we would welcome a unification of these two trading areas within Europe."

With the trend towards industrialization in many of the traditional markets, the group is having to undertake more and more local manufacture, Sir John says.

Better Sales Outlook for Metal Box

REDUCED home demand in the last few months of last year is likely to continue for the first few months of 1961-62, says Sir Harold Roxbee Cox, chairman of the Metal Box Company, Limited, in his statement to shareholders. There are, however, already signs of home demand increasing later in the year and the board would be disappointed if overall sales do not surpass the record for the year ended March 31, 1961. Although oversea subsidiaries show every sign of continued progress, the first half year is not expected to be as good as in the six months to last September.

Sir Harold says that it will be difficult to maintain profit margins in the face of increasing costs, but the board has no doubt that aided by technical advances, new levels of productivity will be achieved. Both in sales and profits the oversea company had an outstanding year in 1960-61 and was responsible for all the increase in the company's profit. The home performance was "unremarkable." As previously reported, group net profit of £4,843,287, compared with £4,459,461, and the 12 per cent. dividend with the equivalent of 10.9 per cent.

The creation of new facilities at home to meet increasing demand required expenditure on buildings and equipment of £6,349,000, and expenditure on a similar scale is likely in the present year, he states.

W. P. BUTTERFIELD, LIMITED, manufacturers of transport and oil storage tanks, cisterns, cylinders, etc., of Shipley (Yorks)—A final dividend of 12½ per cent. increases the total payment for the year ended March 31, 1961, to 18 (15) per cent. Group profit was £228,050 (£157,256), after tax of £228,529 (£126,748). Last year the company reorganized the capital structure and the comparative figures for 1959-60, if the subsidiaries had been included for a full year, would have showed a net profit of £214,891, after tax of £171,407.

Personal

Mr. N. P. Newman's Post with Gas Board

CHAIRMAN and managing director of Newman, Hender & Company, Limited, iron and non-ferrous founders, valve manufacturers, etc., of Stroud (Glos), and its associates, Mr. N. P. NEWMAN has been appointed by the Minister of Power as a part-time member of the South Western Gas Board, with effect from August 1.

MR. N. P. NEWMAN

Mr. Newman is also chairman and managing director of N.H. Engineering, Limited, and chairman of several companies including George Clark & Sons, Limited, Parry Pumps, Limited, and Vee Reg Valves, Limited. He is president of the Joint Iron Council and of the Engineering Employers' West of England Association, and vice-chairman of the British Valve Manufacturers' Association.

Mr. Newman served as chairman of the Council of Ironfoundry Associations from 1949 to 1958. Honorary treasurer of the Institute of British Foundrymen, he is a past president of the institute and a member of the council of the British Cast Iron Research Association. He was made CBE last year.

Former chairman of the National Coal Board, Sir JAMES BOWMAN, has been appointed to the council of King's College, Newcastle-upon-Tyne, for a period of three years.

Mr. E. M. HEAP, joint managing director of York Shipley, Limited, refrigeration engineers, of London, N.W.2, has been appointed to the board of Le Froid Industriel Brissonneau-York, SA, Paris.

General secretary of the Union of Shop, Distributive and Allied Workers, Mr. J. A. BIRCH, has been reappointed a part-time member of the National Coal Board. He was knighted in the recent Birthday Honours.

Mr. GEORGE BODSWORTH, assistant chief purchasing officer, the United Steel Companies, Limited, Sheffield, is retiring after 41 years with the company. A presentation was made to him at a dinner in Sheffield last Friday.

Miss I. WEBSTER, company secretary, Hemmings & Company, Limited, wire manufacturers, of Sheffield, last week received a presentation from the general manager, Mr. J. Hemmings, to mark her 43 years' service with the firm.

Mr. FRANCIS DOUGLAS LEY, chairman and managing director of Ley's Malleable Castings Company, Limited, who was made MBE in the Birthday Honours, was inadvertently listed in our issue of June 16, 1961, as among those who were made OBE.

Mr. JACK HOWE has been appointed to the distinction of Royal Designer for Industry (RDI) by the Council of the Royal Society of Arts, for his work in the field of engineering products and industrial equipment. A Fellow of the Royal Institute of British Architects and of the Society of Industrial Artists, he has through major commissions influenced the design and quality of a wide range of engineering products and electrical equipment.

To mark a half century of service with Marsh Bros. & Company, Limited, makers of high speed and tool steels, of Sheffield, a presentation has been made to Mr. COLIN VAUGHAN. He has been assistant secretary and cashier of the firm for the past 40 years.

In his annual statement to shareholders, Mr. GEORGE RUSSELL, chairman and managing director of S. Russell & Sons, Limited, mechanical and structural engineers, of Leicester, states that he has decided to retire and will relinquish office after the annual meeting on July 17. He was apprenticed to the engineering department of the company in 1909 and apart from war service has worked with it continuously.

FIRST HOLDER of a new research scholarship provided by Firth Brown Tools, Limited, is Nigerian research student Mr. H. E. ENAHORO (32), who is studying for a Ph.D degree in mechanical engineering. The scholarship, the Speedicut Research Scholarship, is part of an endowment from Firth Brown to Sheffield University. Mr. Enahoro, who will work with Dr. D. S. Dugdale on research into the mechanics and design of metal cutting tools, served a year's apprenticeship with Mather & Platt, Limited, as part of his training.

Mr. J. SELWYN CASWELL who takes office as president of the South Wales Institute of Engineers for 1961-62 tomorrow (Saturday), is senior lecturer in mechanical engineering at the University College of Swansea. Mr. Caswell, who is 65, served an engineering apprenticeship with the Ebbw Vale Steel, Iron & Coal Company, Limited, and has been a member of the university college staff since 1921. He is a past president of the Swansea and District Metallurgical Society and has published a considerable number of papers and technical articles on iron and steel.

EUROPEAN "MINERS' STATUTE" TO MAKE INDUSTRY ATTRACTIVE

EUROPEAN "Miners' Statute" to make coal mining an attractive and profitable occupation was debated on Tuesday at the Assembly of the Six Common Market countries at Strasbourg, where the Assembly has been holding its summer session this week. The basic points in the statute are: A higher average wage than other workers; a guaranteed minimum monthly or annual income; shorter working hours than other workers; and guaranteed maximum safety at work.

The statute envisages the miner's career as being divided into two periods. After the first 10 to 15 years he should be paid a "fidelity bonus" of one month's salary for every year of service, to help him train for another occupation if his health suffers from work in the mines. The end of the second period of service would correspond to normal retirement when the miner would be entitled to draw his pension.

The 142-member Assembly unanimously adopted the plan.

THE WEEK-OLD strike at the Swansea press and fabricating works of Richard Thomas & Baldwins, Limited, ended last Friday with the return to work of 250 operatives pending negotiations over a pay claim.

"Cancel NCB Debt"

MINERS BLAME GOVERNMENT FOR INDUSTRY'S BURDEN

AN "overwhelming case" exists for relieving the National Coal Board of some of its financial burdens—a cause which has been strengthened by the Government's proposed action to write off a large part of the British Transport Commission's capital liabilities, says the executive committee of the National Union of Mineworkers in its report to be presented to the NUM annual conference at the beginning of next month. The report describes how this case has been pressed on the Minister of Power, Mr. Richard Wood, without response, and says that the whole question has therefore been referred to the TUC.

The report blames Government policy over a number of years for the Board's financial burden. "Ever since nationalization," it asserts, "the Government has had control over the price policy of the industry, and in the first 10 years of nationalization the price of coal was kept well below the market level, thus preventing the board from making very substantial surpluses."

The industry, it says, was also forced to bear the loss of over £70,000,000 on imported coal and the cost of £25,000,000 for subsidence, which was due in the main to mining operations prior to nationalization. Added to this, it has had to bear a heavy burden of compensation and interest payment, which on interest alone amounted to nearly £260,000,000 between 1947 and 1959. In the last three of four years it had also to bear, without any Government assistance, the high costs of stocking.

Demand for Fuel Policy

The report reiterates the executive's conviction that the only real solution for the problems of the coal industry is a national fuel policy in which coal is given an assured place in the economy. Every possible method has been adopted, it says, to press for the adoption of such a policy, including enlisting the aid of the TUC and making representations to many people from the Prime Minister down. These efforts had not been "wholly without success."

"It cannot be repeated too often that such a policy is not merely in the interests of the coal industry, but in the interests of the whole British economy," says the report. "The country's balance of payments deficit last year—the largest for a decade—serves to underline this point."

Criticizing the application of the Steel Company of Wales, Limited, for a licence to import American coal, the report says: "If the steel companies are so keen to import American coal directly, why did they not do so in the earlier post-war years? Then, with American prices higher than ours, it was left to the National Coal Board to import coal and re-sell it at British prices, so that the NCB had to bear a loss of £70,000,000."

The point is made that, throughout the post-war period, British coal prices have been at least £1 to £1 10s. a ton cheaper than European coal prices, and during this time British steel companies had had this advantage of their European competitors. "If the NCB had been motivated by the same principles as appear to motivate the steel companies, then for the past 13 years they would have charged the full market price for this coal. Instead of this, the British steel industry enjoyed a substantial benefit as a result of the Coal Board's moderation."

The report goes on: "If the steel industry is so concerned with putting market considerations above all else, including the national interest and Britain's precarious balance of payments position, these same considerations should have applied to the National Coal Board's financial and pricing policy in the first 10 years of nationalization. Moreover, let it be remembered that the British steel industry is very substantially protected against foreign competition."

Dealing with "attempts to form a splinter organization" by the Derbyshire and Nottinghamshire Winding Enginemen's Association, and the Yorkshire Winding Enginemen's Association, the report states: "The exponents of a breakaway have inferred that winding enginemen have had a raw deal and that the national union has a complete disregard for their interests, has failed to obtain for winding enginemen the improvements in wages and conditions which are their rightful due and which they claim could easily have been obtained, and that the National Union of Mineworkers would have taken a very different attitude in looking after the interests of other grades of workmen in similar circumstances." The report describes this as "completely untrue."

"The leaders of the breakaway elements," it declares, "are making great play of their ability to force negotiating rights from the National Coal Board. This claim has no substance whatsoever. The National Union of Mineworkers is the union recognized by the Board for negotiating rights under Section 46 of the Nationalisation Act."

In a statement in the report, based on an investigation of figures given in the Digests of Pneumoconiosis Statistics published each year, the union's honorary medical adviser, Dr. A. Meiklejohn, comments on the "continuing occurrence" of new cases of the disease in young miners under the age of 35—988 certifications between 1951 and 1959—in the South Western Division of the NCB, and adds: "I cannot accept that these cases are the result of bad conditions now past. To me they reflect dust conditions existing in recent years and perhaps in some areas even persisting today.

"The overwhelming majority of these cases have occurred in the South Wales coalfield, and this has led to the suggestion that a contributory factor to the early onset of the disease is due to the practice that in these areas new entrants go to the coalface several years earlier than in other coalfields.

"Effective control of the disease primarily depends on reduced dust production, supplemented by maximum suppression by the engineers," he states.

Appointments

To Further NCB's Process Development

AT present a deputy director of the Central Engineering Establishment of the National Coal Board at Bretby (Derbyshire), Mr. CHARLES JAMES Moss has been appointed assistant director-general of the NCB's process development department which was formed in April, 1959, under Dr. J. Bronowski, to further the development of new processes for treating coal and in particular for bringing new processes for making smokeless briquettes from small coal to the stage of commercial production.

Mr. Moss, who is 43, was educated at Northgate School, Ipswich, and London University, where he gained a first class honours degree in mathematics and won the Sir John William Lubbock Memorial Prize. He also gained blues for rugby and water polo. In 1939 he joined Rotol, Limited, Gloucester, and later was on the staff of the Royal Aircraft Establishment, C.I.B.A., Limited, and, from 1951 to 1958, the Billingham division of Imperial Chemical Industries, Limited. He joined the Coal Board in July, 1958.

Mr. G. E. TIMMS has been appointed chief engineer at the Silvertown, London, factory of BTR Industries, Limited.

Mr. J. B. M. ALEXANDER has been appointed welfare officer at the Steel, Peech & Tozer, branch of United Steel Companies, Limited, in succession to Mr. J. P. Wilks.

Chief planning engineer with Distington Engineering Company, Limited, branch of the United Steel Companies, Limited, Cmndr. M. G. LYNE has been appointed production manager (engineering). Mr. J. W. LOWE, who has been acting machine shop manager, is appointed permanently to the post.

Mr. J. E. PARDOE has been appointed assistant Area general manager in the Lothians Area of the Scottish Divisional Coal Board in succession to Mr. W. S. Cairns. He joined the board in 1957 as divisional chief finance officer, after being commercial manager with an Edinburgh firm of building and civil engineers.

Mr. S. W. ALLSOPP has resigned his position with Renault Machine Tools (U.K.), Limited, Shrewsbury, and joined Herbert Widdowson & Sons, Limited, engineers and machine tool and machinery merchants and exporters, of Nottingham, as development engineer on Berardi unit construction machines utilizing Berardi unit heads.

Mr. RONALD B. DALES, who has been appointed group area manager for the Grantham engineering firm of Aveling-Barford, Limited, in its East Midlands and East Anglia area, in succession to Mr. J. R. Pulfrey who has become home sales manager for earthmoving equipment, has, since 1957, been divisional sales manager in Eastern Canada for the Canadian subsidiary.

Mr. GEORGE S. CROFTS, who has been with Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, since leaving school, has been appointed production planning manager of the excavator division. From tomorrow (Saturday) he will be responsible to Mr. W. Washbourne, general manager of the division, for the programming, implementation and data-processing of all pre-production planning throughout the division. He was appointed chief designs engineer in 1957 and has visited America and Europe on behalf of Newton, Chambers.

Head of New Technical Aid Department

FORMERLY Minister of State at the Home Office, Mr. Dennis Vosper has been appointed head of the new Department of Technical Co-operation. He is succeeded by Mr. David Renton, Under Secretary at the Home Office.

MR. D. L. RENTON

The new department will have the task of co-ordinating UK technical assistance to all countries oversea, and for dealing with oversea organizations having this kind of function. It will have a budget of £30,000,000, but will not be concerned with capital loans or with general foreign policy matters, for which the Foreign Office, the Commonwealth Relations Office, and the Colonial Office will remain responsible in their various spheres. Mr. Vosper's appointment was one of a number of ministerial changes announced on Tuesday.

Mr. Renton was Parliamentary Secretary to the Ministry of Fuel and Power from 1955-57, and to the Ministry of Power from 1957-58. Mr. Alan Green, MP for Preston South, who has been chairman of the Walmsley (Bury) Group, Limited, paper-making machinery manufacturers, of Bury (Lancs), gains ministerial office for the first time as a result of the changes. He becomes Parliamentary Secretary to the Ministry of Labour in succession to Mr. P. J. M. Thomas. Mr. Green resigned the chairmanship of the Walmsley group this week and is succeeded by Mr. H. G. Sheldon, formerly managing director.

French Steel Company's Increased Activity

IN his speech at the annual meeting of Forges et Acieries de Nord et Lorraine in Paris, M. Georges Lenormand, chairman, indicated that for the first five months of the current year, activity was 12 per cent. up on the corresponding period of 1960. Iron-ore mining reached 2,900,269 tons, an increase of 16.76 per cent., output of crude iron rose to 335,701 tons (51 per cent.), and output of liquid oxygen rose by 4 per cent. to 1,220,000 gallons.

An additional investment concerns the setting up of an ore-sintering plant which is expected to be completed at the end of 1962. Net profit for the year was 3,793,000 fcs. and it is proposed to distribute a gross dividend of 8.55 fcs. per share, equivalent to 17.1 per cent.

BELLIS & MORCOM, LIMITED, manufacturers of steam turbines and engines, etc., of Birmingham—With a group loss of £377,841 for the year to March 31, 1961, there is no dividend. Loss for the previous year was £126,325, including a tax credit of £18,665, and, after an interim payment of 3 per cent. there was then no final dividend.

HIGHER COSTS AGAIN

Guest, Keen & Nettlefolds the Victims

ALTHOUGH record net profits of more than £15,000,000 were recorded in 1960 by Guest, Keen & Nettlefolds, Limited, the steel products group, and turnover in the current year has been maintained at about the same rate as last year, pressure on margins continues as a result of ever-increasing costs and a highly competitive trading position, said Mr. K. S. Peacock, chairman, in his report to the annual meeting in Birmingham last week.

"We are finding increasing difficulty," he said, "in maintaining our profit margins, due to substantially increased costs arising from increase in the price of coal, fuel, oil, higher wages, and local rates." Taking the long term view, he added, it would be difficult to maintain the rate of growth achieved in the 10 years to 1960. Sales in the home market and exports from the UK would be subject to strong competitive influences from the Common Market countries and elsewhere, notably Japan.

The chairman said that his own opinion was that a deeper reason for the UK's inability in recent years to achieve a better export performance was to be found in the Government's "stop and go" attitude towards industrial investment. Repeatedly, in post-war years, it had tried to encourage exports by taking measures to restrict home demand. In the short term, such measures might have a beneficial effect on exports in that industry faced with falling home demand was forced to export more. The long term result, however, must be to diminish investment and therefore to limit the capacity available to accommodate both a rising home demand and a large volume of exports.

The meeting approved a resolution increasing the directors' remuneration from £25,000 to £50,000 after the chairman had pointed out that the figure had remained at this since 1920.

Hot Dip Galvanizing Plant for SCOW

WORK is to start in November on the construction of a continuous hot dip galvanizing plant in the steel division of the Steel Company of Wales, Limited. The line will be of the Armco-Sendzimir type, for which SCOW has an arrangement with Armco covering its construction and operation. The installation will cost more than £900,000 and will be the second of its kind to be installed in Britain.

The line is scheduled to be in production by the end of next year. Steel strip up to 54 in. wide and in thicknesses ranging from .015 in. to .062 in. will be processed at up to 150 ft. per minute.

NEW ADDRESS of the London offices of Rhodes, Brydon & Youatt, Limited, engineers, of Stockport (Ches), is 45/51, Leman Street, London, E.1 (telephone: ROYal 1212).

Lower Half-year Trading Profits by Dorman Long

TRADING profits for the half-year to March 31, 1961, of Dorman Long & Company, Limited, iron and steel manufacturers, construction engineers, and bridge builders, have been running at a lower level than for the same period last year, the directors announce. The interim dividend is maintained at 3½ per cent. in respect of the year to September 30, 1961. A total of 10 per cent. was paid for 1959-60.

Ingot production for the half-year increased from 1,159,662 tons for the 1959-60 period to 1,202,264 tons. Steel prices were reduced in February, 1960, and costs of production have since increased through advances in coal prices, wages, etc. In the result, margins for depreciation and profit on iron and steel products are reduced and trading profits have consequently been running at a somewhat lower level.

At present, the directors add, there is a reduced forward order-book for all steel products. The engineering works are fully employed, but prices are low owing to keen competition. The results of these departments depend on contracts actually completed, but are expected to show some improvement on last year.

Engineering Orders Still at High Rate

HIGH rate of new orders received by the mechanical and electrical engineering industries continues, the latest Board of Trade figures showing that the sharp rise recorded in March was well maintained in April when the figure was 18 per cent. more than a year ago. Like the March figure, however, the total was inflated by large power station contracts. Net new export orders on the other hand fell sharply from the March index number of 150 to 98 in April.

Statistics already published of new export orders in the first quarter of 1961 have now been revised upward, and they are now estimated to have been 4 per cent. more than a year earlier. In spite of increased deliveries, order-books have lengthened owing to the increase in net new orders. At the end of April the volume of new orders on hand was 10 per cent. higher than at the beginning of the year. New orders for the home market were 12 per cent. higher.

A SPECIAL DEPARTMENT to deal exclusively with the recruitment and appointment of staff for all aspects of computer work has been formed by Senior Staff Consultants, Limited, London, W.1.

Law Cases

Lords Dismiss Appeal

APPEAL by Mr. Leo Close, instrumental machinist, from a decision of the Court of Appeal which had affirmed Mr. Justice Winn and held in favour of the employers, the Steel Company of Wales, Limited, that it was not in breach of its duty under Section 14 (1) of the Factories Act, 1937, to fence securely "every dangerous part of any machinery," was dismissed in the House of Lords. Mr. Close was injured by pieces of a bit of an electric drill which shattered during operation and struck him in the eye.

The majority of the House (Lord Denning dissenting) held that it was bound by earlier decisions of the House to hold that the duty imposed on the employer under the section was to prevent the workman coming into contact with moving parts, and did not comprehend protection from injury caused by ejected or flying parts of the machine itself, though on the facts of the present case that point did not arise directly for decision, since the bit was held not to be a dangerous part of machinery within the section.

EXPLOSIVES OFFENCE

KIRKCALDY miner, Andrew Rodger, was fined £10 or 50 days' imprisonment at Kirkcaldy Sheriff Court for contravening the Coal Mines (Explosives) Regulations, 1956. He admitted that on May 24, at Rothes Colliery, Thornton, being in possession and control of a canister of explosives, he failed to return it to a safe place on the surface.

Rodger told Sheriff Sinclair Shaw that he was working on a five-man job and explained it was the practice that if one man took the box of explosives underground, someone else brought it up. He took the box down, but as his clothes were wet, he left the pit bottom before the others at the end of the shift. He assumed one of the other men would bring the box up.

MINER'S DAMAGE CLAIM FAILS

CLAIM for damages against the National Coal Board by Mr. Kenneth Kingswood, (29), a miner, of Sheffield, now a labourer, was dismissed by Mr. Justice Austin Jones at Sheffield Assizes. Mr. Kingswood was said to have lost his sense of taste and smell and to be paralysed down one side of his face after a pit accident at Nunnery Colliery in September, 1955.

Judgment with costs was given for the NCB who resisted the claim and alternatively alleged contributory negligence. The judge said it had not been easy to decide exactly what happened, but he was not satisfied that the account given by Mr. Kingswood was accurate. "It may be that he has forgotten," he said.

COAL BING THEFTS

ELEVEN people were fined at Kirkcaldy (Fife) Sheriff Court for stealing a ton of coal from the redd bing at Michael Colliery, East Wemyss. Mr. Brian Wood, solicitor for the defendants, nine of whom denied the charge, said he thought it was the first time there had been a prosecution of this type of offence at the colliery. He suggested it might be treated as a test case between the Coal Board and natives of East and West Wemyss who collected coal there.

Sheriff Sinclair Shaw said one submission by the defence was that if the board chose to tip waste in a position where it knew it would sooner or later be carried away by the sea, and made no attempt to enclose that waste, it must be held to have lost the right of property.

"I think the balance of the evidence is plainly to the effect that the great bulk of the redd or waste which is dumped does in fact remain where it is dumped, although there is some slight attrition by the sea which the board remedies when it occurs. But I am quite unable to accept the view that because the board may lose some of the waste by attrition, they have thereby lost the right of property in the waste which is being dumped," said the Sheriff.

He fined the eleven people involved £7 each. One man was also fined £5 on a second charge.

TWO MINERS, John McGair, and Henry Hunter Ostlere, were each fined £12 or 60 days' imprisonment at Kirkcaldy Sheriff Court after admitting that, while below ground at Wellesley Colliery, Denbeath, they walked over a haulage road when vehicles were in motion.

DAMAGES of £902 were awarded against the National Coal Board at Sheffield Assizes to Mr. James Harper Johnstone, (39), for injuries received in two falls on a road leading to the Manvers Main coal preparation plant. It was claimed that this was due to the state of the road.

THOMAS DOIG MILLIGAN, an unemployed miner who admitted at Buckhaven Police Court to stealing 40 lb. of washed doubles (value 2s. 6d.) from the redd bing at Wellesley Colliery, Denbeath, and assaulting the colliery watchman, agreed that it was not worth the trouble caused. He was fined £2.

AT Monmouthshire Assizes Mr. Justice Atkinson, dismissing a claim by Mr. John Edward Jones (37), a metal fitter, for damages of £1,500 against his employers, the Rhymney Engineering Company, Limited, said he was not satisfied the company was guilty of negligence or breach of statutory duty.

PLEADING GUILTY to having been in possession of a cigarette packet and a lighter in the Red zone of No. 2 Mine, Woolmet Colliery, a safety lamp mine, near Portobello (Midlothian), Alfred Cooper (21), was fined £20 at Edinburgh Sheriff Court. He was warned by Sheriff A. J. Stevenson, "This is the most dangerous thing you can do in a pit. It causes many accidents, involving the death of many people."

HALIFAX ENGINEERING FIRM PLANS REORGANIZATION

HALIFAX engineers and lathe chuck makers, F. Pratt & Company, Limited, is to be reorganized with a view to major expansion in the European Common Market. F. Pratt Engineering Corporation, Limited, is to be the new style of the company, which is to become a holding concern, while the existing trading business will be transferred to a wholly-owned subsidiary being formed under the existing name of F. Pratt & Company, Limited.

The company, which has two home subsidiaries, F. Burnerd & Company, Limited, and Pratt Precision Hydraulics, Limited, as well as an American subsidiary, Winchester Tool Corporation, is considering the establishment of a new subsidiary either to supply or give services in the Common Market.

New finance is to be supplied through an issue of £300,000 7 per cent. unsecured convertible notes.

Company News

BALFOUR AND DARWINS

£6,500,000 Merger Proposal

MERGER is proposed between the two Sheffield groups, Arthur Balfour & Company, Limited, and Darwins Group, Limited, both of which are engaged in the manufacture of high-grade steels, through the formation of a holding company, Balfour & Darwins, Limited. The combined assets of the two groups amount to about £6,500,000. A one-for-10 scrip issue in ordinary is proposed by Arthur Balfour, after which a straight exchange is offered holders of both companies into the new holding company.

The scrip issue will raise Balfour's issued capital to £1,045,981, all in ordinary 10s. shares. Darwins has in issue 450,000 6 per cent. cumulative preference £1 shares and 2,007,500 Ordinary 10s. shares. The offers will be conditional on 90 per cent. acceptance and approval of the Balfour scrip issue on July 14.

With a view to equalizing dividend distribution, it is proposed that on the offers becoming unconditional each company will pay an interim dividend of 6 per cent. The Balfour interim will be on the capital to be increased by the scrip issue. Balfour & Darwins will acquire the capital of the two companies at June 30, 1961, subject to ordinary holders retaining the interim dividends.

Board Structure

The directors of both companies are of the opinion that the merger should bring substantial advantages as the two businesses are largely complementary. Apart from immediate and long-term advantages, the merger will give Darwins access to the world export sales organization built up by Balfour. The management structure of both companies will be retained.

Mr. F. Thompson-Schwab, chairman of Darwins, will be chairman of the new company, and Lord Riverdale, chairman of Balfour, will be deputy chairman, with Mr. Mark Balfour as managing director. Lord Riverdale is relinquishing his appointment as managing director of Arthur Balfour, but is retaining the position of chairman and will in future be designated executive chairman. At the same time, Mr. Balfour and Mr. L. Wright, who are at present assistant managing directors, are being appointed managing directors.

HEPWORTH IRON COMPANY, LIMITED—The company has acquired for cash over 75 per cent. of the issued share capital of Labrecque Engineering Company, Limited.

SHIP CARBON COMPANY OF GREAT BRITAIN, LIMITED (subsidiary of Morgan Crucible Company, Limited)—Net profit for 1960 is £88,200 (£87,151), after tax of £84,248 (£80,395).

BRITISH GLUES & CHEMICALS, LIMITED, London, W.C.2—Net profit is up to £311,219 (£252,905), after tax of £147,000 (£132,000) and the dividend is maintained at 22½ per cent. with a final of 17½ per cent.

SPEAR & JACKSON, LIMITED, toolmakers, etc., of Sheffield—Payment of a final dividend of 12½ per cent. brings the total for the year to December 31, 1960, to 17½ per cent. which is effectively just over 2 per cent. higher than the previous year allowing for the increase in capital on the acquisition of the Brades, Limited, group. Net profit was £163,982 (£211,115), after tax of £188,932 (£156,208).

MANCHESTER DRY DOCKS COMPANY, LIMITED—With a final of 7½ per cent. for the year to March 31, 1961, total less-tax dividend is raised to 12½ (12) per cent. and a capital profits distribution of 4s. per £1 share, not subject to tax, is proposed.

JOHN BOOTH & SONS (BOLTON), LIMITED, structural engineers and bridge builders, etc., of Bolton (Lancs)—Final dividend of 12½ per cent. makes 17½ (12½) per cent. for the year to March 31, 1961. Net profit increased to £31,284 (£13,813) after tax of £32,200 (£9,400).

SYMONDS ENGINEERING COMPANY, LIMITED, sheet metal workers and toolmakers, of Cheshunt (Herts)—Dividend is being raised to 32½ (27) per cent. for the year to March 31, 1961, with a final of 22½ per cent. Net profit increased to £62,488 (£48,213), after tax of £64,654 (£46,398).

WATSON, LAIDLAW & COMPANY, LIMITED, manufacturers of sugar and laundry machinery, iron and non-ferrous founders, etc., of Glasgow—The company incurred a loss of £10,352 for the year to March 31, 1961, against a net profit of £18,726 previously, and the dividend is halved to 5 per cent.

WARSOP POWER TOOLS, LIMITED—At the extraordinary meeting on Tuesday, resolutions were passed for the purpose of enabling amalgamation with Fram Reinforced Concrete Company, Limited, and the Russell Building & Contracting Company, Limited. The change of the company's name to the Fram Group, Limited, was also approved.

ALLIED IRONFOUNDERS, LIMITED—In the year ended April 1, 1961, group sales showed a significant increase without taking into account the turnover of recently-acquired companies, but increased costs reduced profit margins. The market for central heating boilers continues to develop and a new sales division has been found to exploit it to the best advantage.

WILLIAM BAIRD & COMPANY, LIMITED—Dividend for 1960 is being raised to 15 (14) per cent. with a final of 11 per cent. As forecast, there is a final capital dividend of 2 per cent. from surplus on realization of fixed assets, making 3 per cent. for the year (nil), not subject to tax. Group net profit increased to £451,346 (£383,902), after tax of £360,887 (£196,972).

TRIPLEX FOUNDRIES GROUP, LIMITED—In his annual statement, the chairman and managing director, Mr. W. H. L. Harrison marks the silver jubilee of the company by giving a brief resume of changes undergone over the past 25 years. Looking to the future, he states that the group "is nicely placed for business

with due regard being paid to changing trends." Profit for the year, after taxation rose to £158,689 (£105,376).

S. RUSSELL & SONS, LIMITED, mechanical and structural engineers, of Leicester—Profit for the year to March 31, 1961, was a record at £200,171 (£158,089). A final dividend of 10 per cent. makes a total of 15 (12½) per cent. The foundries have been working to capacity for most of the year and, states the chairman, Mr. George Russell, it has been and still is, difficult to meet the demand for most types of castings, particularly S.G. iron.

ASSOCIATED COAL & WHARF COMPANIES, LIMITED, shippers and distributors of coal, etc., of London, E.C.3—With a final dividend of 10 per cent. total distribution for the year to March 31, 1961, is increased to 13 (12) per cent. Group profit improved to £553,329 (£519,619), but, after increased tax of £282,992 (£249,193), the net balance is virtually unchanged at £270,337 (£270,426). The company's net profit is £253,073 (£251,509).

GEO. W. KING, LIMITED, mechanical handling equipment engineers and manufacturers, of Stevenage (Herts)—Mr. Donald M. King (chairman), told the annual meeting on Tuesday that of the firm's "very satisfactory" order-book, direct export work, including letters of intent, amounted to half. The company proposes a rights issue to existing shareholders of 816,000 ordinary shares of 5s. each at 12s. 6d. per share in the proportion of one-for-three.

A. REYROLLE & COMPANY, LIMITED, electrical engineers and switchgear manufacturers, of Hebburn (Co. Durham)—The company has declared unconditional its recent offer to holders of Nalder Bros. & Thompson, Limited, to acquire the 109,500 ordinary shares not already owned by Reyrolle and the 15,000 8 per cent. preference. Acceptances have been received in respect of all the shares. It is intended that the Nalder business will be continued on similar lines as before.

HERBERT TERRY & SONS, LIMITED, manufacturers of springs, etc., of Redditch (Worcs)—After tax of £77,236 net profit for the year 1960 is £151,810 (£141,032). A final dividend of 7½d. per share on the ordinary and the "A" ordinary shares is recommended making 10½d. per 5s. share (same), or 17½ per cent. for the year. Production in the current year is well maintained and steps are being taken to secure additional manufacturing facilities at Plymouth, says the chairman, Mr. Norman V. Terry.

DAVID BRIDGE & COMPANY, LIMITED, specialist engineers to the rubber, plastics, and cable-making industries, of Rochdale (Lancs)—Reduced interim dividend of 5 (7½) per cent. is because current trading results are being adversely affected by a reduction in output, say the directors. At this stage it is not practicable to make an estimate of profit for the full year to September 30, 1961, but present indications are that it will be considerably less than for the previous year, when a final payment of 15 per cent. was made.

RICHARDSONS, WESTGARTH & COMPANY, LIMITED, electrical and general engineers, boilermakers and ironfounders etc., of Wallsend-on-Tyne—Group profits, before tax, fell to £128,042 (£516,900) for the year to April 1, 1961. There is no dividend, against 10d. per 10s. share previously, but a tax-free capital distribution of 1½d. per share is proposed out of capital reserves. Directors state that this further reduction in profits is due to continuing excess capacity and severe competition in the marine engineering and power plant industries in which the group is primarily engaged. In consequence, it is still necessary to take contracts at uneconomical prices.

Board Changes

DARLINGTON & SIMPSON ROLLING MILLS, LIMITED—Mr. John F. Crittall has been appointed a director.

MINING ENGINEERING COMPANY, LIMITED—Mr. J. Lancaster, secretary of the company, has been appointed to the board.

JAMES HOWDEN & COMPANY, LIMITED—Mr. Henry K. Roseveare has been appointed to the board and Mr. Henry L. Paul has resigned.

THOMPSON BROS. (BILSTON), LIMITED—Mr. Ernest Phillips, managing director, has been appointed chairman in succession to Mr. H. J. Thompson.

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Mr. C. Leslie Smith has resigned from the board of the company and its subsidiaries.

ADAMANT & WESTERN ENGINEERING, LIMITED—Mr. P. G. Parkes has resigned from the board of the company and its subsidiaries, Adamant Engineering Company, Limited, and the Marles Steering Company, Limited.

REDHEUGH IRON & STEEL COMPANY (1936), LIMITED—Mr. H. C. Mumford, a director since 1951, has been appointed deputy chairman. Mr. R. Moses has been elected to the board and appointed deputy managing director.

R. H. NEAL & COMPANY, LIMITED—Mr. C. S. Shaw has been appointed assistant managing director of the company, a subsidiary of Steel & Company, Limited. He was formerly technical director of K & L Steelfounders & Engineers, Limited.

BROWN BAYLEY, LIMITED—Dr. F. P. A. Garton has been appointed a director. Mr. J. H. Shelmerdine and Mr. A. Kilpatrick Brown have been appointed directors respectively of the subsidiaries, Brown Bayley Steel, Limited, and Hoffmann Manufacturing Company, Limited.

BRITISH STEEL CONSTRUCTIONS (BIRMINGHAM), LIMITED—Mr. G. S. James, Mr. Lloyd Ressler, and Mr. H. H. Warner have been elected directors, while Mr. W. Basil Holden, Mr. H. Hall, Mr. A. W. Jeffs, Mr. R. I. Skeet, and Mr. B. A. Thomas have retired from the board.

SCOTTISH MACHINE TOOL CORPORATION, LIMITED—Mr. H. M. M. Hyston has been elected chairman, but will continue as managing director. He will take over his new duties after the annual meeting on July 13, and succeeds Mr. D. Sharp, who has resigned, but continues on the board.

SUBMARINE CABLES, LIMITED—Mr. G. H. Foot has been appointed director and chief engineer of the company, which is jointly owned by Associated Electrical Industries, Limited, and British Insulated Callender's Cables, Limited. Mr. S. J. Wilson has been appointed works director from August 1.

EDWIN DANKS & COMPANY (OLDBURY), LIMITED—Lt.-Gen. Sir William Stratton has been appointed chairman of the company and of Penman & Company, Limited, in succession to the late Gen. Sir Kenneth Crawford. Both companies are members of the Babcock & Wilcox, Limited, group.

DERBYSHIRE STONE, LIMITED—Mr. J. E. C. Bailey has been appointed to the board. He will continue his executive duties in the Baird & Tatlock (London) Limited Group. Mr. Bailey is chairman and managing director of the operating companies in that group, which comprises Baird & Tatlock (London), Limited, Hopkin & Williams, Limited, and W. B. Nicolson (Scientific Instruments), Limited, all members of the Derbyshire Stone group of companies.

BRITAIN'S FIRST LURGI GASIFIER

New Indigenous Source of Refined Fuel

The Lurgi process for the production of high-pressure gas is likely to be of great significance to both the gas and the coal-mining industries, for it is able to convert large quantities of low-grade non-caking coal into a refined fuel. In addition, the gas is produced at high pressure, which facilitates its distribution without the use of compressors along the route. Both these features are of extreme importance to Britain and it is for these main reasons that the process is welcomed to this country.

BUILT by the Scottish Gas Board, at a cost of £6,600,000, Britain's first Lurgi pressure-gasification plant at Westfield (Fife), was officially opened on Tuesday by the Queen, who was accompanied by the Duke of Edinburgh.

The plant is at present producing 15,000,000 cu. ft. of gas per day, but when the second stage of construction is completed early in 1962, this output will be doubled to 30,000,000 cu. ft. per day, an amount equivalent to one fifth of the present total demand for gas in Scotland.

Since the gas is made at high pressure it can be readily distributed over considerable distances. The Scottish Gas Board is therefore also constructing a high-pressure pipeline across central Scotland, which, when linked with existing grid systems, will enable gas from Westfield to be distributed over an area of 4,000 sq. miles. The estimated total cost of the works and the high-pressure pipeline together is £8,500,000.

The Lurgi process makes large quantities of gas from low-rank non-caking open-cast coal which is totally unsuitable for gas making by orthodox means. In effect, this means the development of a wholly new indigenous source of refined fuel. The plant has been built adjacent to the workings of the Opencast Executive of the National Coal Board; the contract between the Scottish Gas Board and the NCB provides for adequate supplies of coal to be made available to the works for a period of 20 years or during the life of the open-cast workings, whichever is the longer. A mixture of ½-in. to 1-in. washed coal, to which a proportion of middlings has been added, is delivered to the works by railway wagon; and carried by conveyor belt to the gasifiers.

The Gasifiers

The Lurgi gasifier (Fig. 1) is a mild-steel vessel of fusion-welded construction. The main vessel is approximately 19 ft. overall height; with an outer

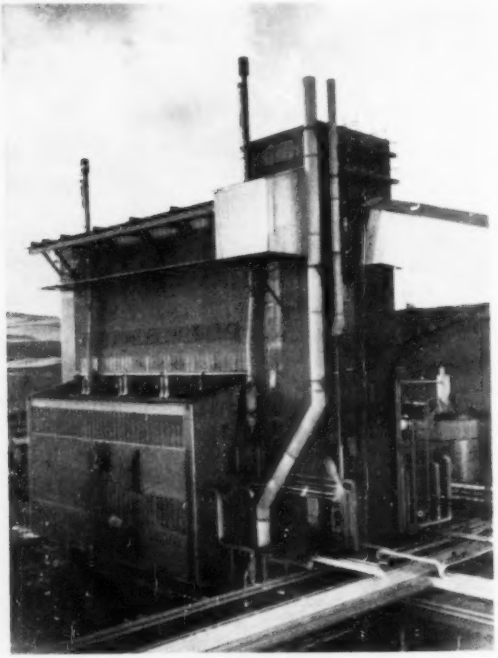


Fig. 1.—The Lurgi house in which the three gasifiers are installed. Each weighs 50 tons and, when in operation, consumes 240 tons of coal, 60 tons of oxygen, and 220 tons of steam to produce the equivalent of at least 7,500,000 cu. ft. of gas per day.

diameter of 10 ft. The coal enters through a lock-hopper attached to the top of the gasifier; steam and oxygen at high pressure are introduced at the lower end; and the gas is generated as a result of the reaction of steam and oxygen with the coal at a pressure of about 30 atm. Each gasifier produces upwards of 7,500,000 cu. ft. of gas a day. Normally, with the present output of the works two are in use with one as a standby.

The three gasifiers first installed at Westfield were all made in Germany. The second stage of construction, however, provides for the installation of a fourth gasifier, and as a result of an agreement made between Humphreys & Glasgow, Limited, London, the main contractors, the Power Gas Corporation, Limited, Stockton-on-Tees, a member of the Davy-Ashmore group, and Lurgi Gesellschaft Fur Warmetchnil M.B.H., Gervinusstrafe, this will be made in Britain and will be the first of its kind manufactured outside Germany.

Fluidized Fuel Bed Boiler

The Westfield works contains a number of new features which, in addition to the gasifiers, have never before been operated in Britain. In planning the works it was accepted that the type of grate to be installed in the steam-raising plant must be capable of burning fuel containing a large percentage of coal fines (below ¼-in.) and having a high ash content, since this type of fuel would probably prove more economical than others. No satisfactory installation for the particular requirements of this process could be found in this country.

It was known, however, that a new type of grate, operating on a "fluidized fuel bed" principle, had been installed in certain boiler furnaces in France and a visit was paid to these installations in 1958 with the result that this type of grate had been adopted for the works. It is known as the "Ignafluid" grate. In the first stage of construction two boilers, manufactured by Babcock & Wilcox, Limited, have been installed. Each is capable of producing 45,000 lb. of steam an hr. at a pressure of 450 lb./sq. in.

Coal fines enter the furnace through a port in the front wall and fall on to the mechanical grate; a pulsating flow of air from the underside of the grate holds the fuel bed in suspension, causing some of the fine particles to burn in suspension; the majority is eventually deposited on the combustion surfaces of the furnace floor at either side of the mechancial grate; fusion takes place on these surfaces and the ash in semi-molten form flows down the slope onto the grate and is then carried to the back of the furnace and finally deposited as clinker onto the ash conveyor.

Oxygen Plant

Westfield is the first gasworks in Britain to use oxygen on a large scale for the production of town gas. After many oxygen plants were inspected in gasworks and other industrial establishments in Europe, America, Canada, and South Africa, it was finally decided to install an oxygen plant of the liquid-pump type, designed and built by the British Oxygen Company, Limited, because this provides the necessary facilities for adequate storage of liquid oxygen.

Great importance is attached to the reliable and continuous production of oxygen since the Westfield works is a key manufacturing station in the grid system of central Scotland. Oxygen plants may be considered to be reliable units, but any occasional unplanned shutdown would have direct repercussions on gas output. It is thus necessary to have adequate storage to cover periods of major maintenance work; and the system adopted provides sufficient capacity to hold 560 tons of liquid oxygen in storage.

A general view of the two tonnage oxygen plants is shown in Fig. 2.

Vaporization of the liquid oxygen takes place in a heat exchanger, after which it is pre-heated and passed to the Lurgi gasifier as gaseous oxygen at the required pressure of 426 lb./sq. in. This is the first time liquid oxygen pumps have been used anywhere for the Lurgi gasification process; all other plants have used gaseous oxygen compressors for this purpose.

Brief reference has been made to the coal, steam, and oxygen which come together in the gasifiers to produce gas. The next stages are those of cooling and purification. Crude gas leaves the gasifiers at a temperature of between 400 and 450 deg. C and tar-water is sprayed into the gas in a quench cooler and its temperature is reduced to about 196 deg. C. This allows the fullest use to be made of the latent heat of the gas as it passes through the waste-heat boilers; and considerable quantities of low-pressure steam are obtained and used as process steam in the purification plant.

The gas passes from the waste-heat boilers to a pre-cooler and from thence in twin streams to another installation of coolers, each stream of which consists of two vertical tubular water-cooled heat exchangers in series called respectively the "after-cooler" and the "final-cooler."

Stages of Purification

After the gas leaves the coolers it passes through various stages of purification. Benzole is removed by washing with light oil. A further stage is the removal of carbon dioxide and hydrogen sulphide and the method adopted at Westfield is the hot potassium carbonate process in which the simultaneous removal of carbon dioxide and hydrogen sulphide takes place. This is done in the Benfield plant (Fig. 3), the tall towers of which are one of the most striking features of the works.

The carbon dioxide content of the Lurgi gas when it leaves the coolers is approximately 27 per cent.; and the hydrogen-sulphide content about 0.8 per cent. The high carbon-dioxide content must be reduced in view of its effect on the calorific value of the gas. Essentially, the "Benfield" process involves the absorption of carbon dioxide and hydrogen sulphide in a 35 per cent. solution of potassium carbonate at high pressure and at a temperature of approximately 110 deg. C.

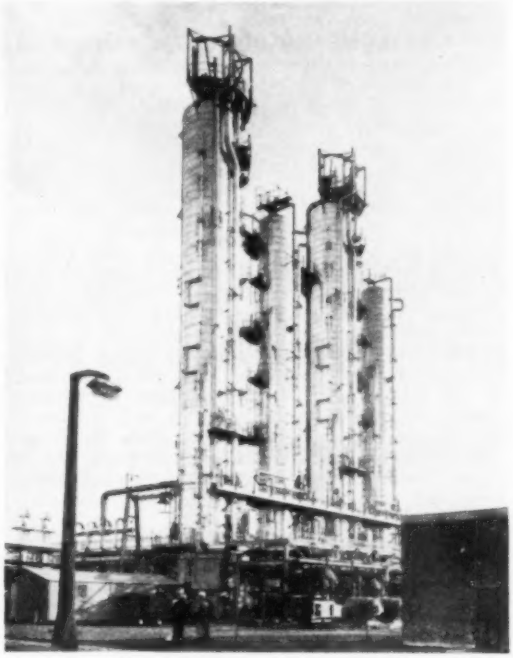


Fig. 3.—The Benfield plant for the removal of carbon dioxide and the reduction of hydrogen sulphide concentration in the gas.

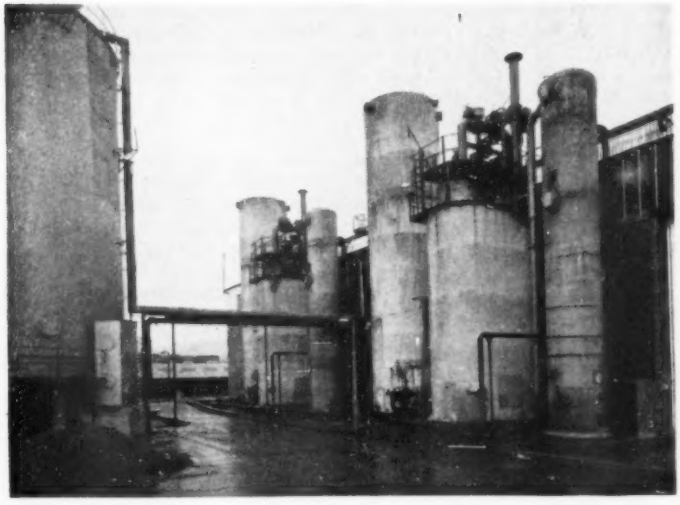


Fig. 2.—The two tonnage oxygen plants, each one consisting of the air separation unit (left), regenerator (centre), and direct cooler (right).

The carbon dioxide and hydrogen sulphide react with the potassium carbonate to form potassium bicarbonate and potassium bisulphide respectively; the solution leaves the absorber and, after a reduction of pressure from 325 lb. to 5 lb./sq. in., passes to a regenerator vessel where conventional steam stripping is carried out at the same temperature.

The acid gases (or waste gases) leaving the top of the regenerator consist of approximately 98 per cent. carbon dioxide and 2 per cent. hydrogen sulphide. After being cooled they pass to a catalytic conversion plant where all hydrogen sulphide is oxidized to sulphur dioxide. The waste gases are then mixed with boiler flue gases and finally pass

to the main chimney stack. Plant for the recovery of sulphur from the waste gases will be installed during the second stage of the construction of the works.

The Benfield plant has been designed to give an absorption efficiency of carbon dioxide and hydrogen sulphide of over 90 per cent. In order to purify the gas to statutory requirements, it is necessary to add a further stage of purification before the gas passes into the grid main and the Bischoff system of oxide purification has been chosen for the final stages of hydrogen sulphide removal.

The gas which has been produced and purified by the processes described requires to be "conditioned" so that its calorific value and specific gravity correspond to district requirements. The purified Lurgi gas has a calorific value of 400 B.t.u./cu. ft. and at present the gas is enriched to 450 B.t.u./cu. ft. by the addition of butane, supplies of which are brought in by road from Grangemouth oil refinery, 35 miles from Westfield.

The Westfield works is being constructed in two stages. During the second stage, which is now being completed, the fourth Lurgi gasifier will be installed and together with a newly developed plant for the reduction of the carbon-monoxide content of the gas. A further steam boiler of the "Ignafluid" type, and sulphur-recovery plant for the removal of sulphur from the waste gases will also be introduced.

The principal effect of these further developments will be that the total production of gas will be doubled. The effect of the carbon monoxide conversion plant will be to reduce the carbon monoxide content of the gas to less than 8 per cent.; it will also help to reduce the specific gravity of the final gas. The carbon-monoxide conversion plant will be installed at the outlet of the waste-heat boiler and will treat hot crude Lurgi gas at a temperature of approximately 105 deg. C. This will be the first "raw gas conversion plant," as it is called, to be installed outside Germany.

Although the Scottish Gas Board's Westfield works with its present productive capacity is already making a considerable contribution to the refined fuel needs of Scotland, much still remains to be done before construction is completed. The works will provide valuable experience to the Scottish Gas Board and the gas industry in general. In the planning of the works, much has been gained from information freely made available by those engaged on similar projects in other parts of the world; every lesson learned during the construction and operation of Westfield will be made available, if desired, for the benefit of those concerned with the building of other Lurgi plants in the future.

ELECTRONIC TELECONTROL EQUIPMENT

FOR some years close co-operation between the coal, electricity, and gas industries in connection with radio communication and frequency planning problems has been achieved through the Joint Radio Committee of the Nationalized Fuel and Power Industries. This committee has long realized that the three industries have much in common in regard to the remote indication and control of plant at unattended points over both wire and radio links. As the basic requirements of the separate industries are virtually identical, although related to the indication and control of different types of plant, the committee has prepared a basic specification for electronic telecontrol equipment which sets out the common requirements. In this way it is hoped to rationalize the production of suitable equipment and avoid the necessity to design equipments on an individual basis for specific applications.

The specification provides information on the minimum facilities required and guidance on the techniques preferred, *e.g.*, the use of items such as cold cathode tubes, transistors, magnetic cores, etc., rather than electro-magnetic relays and hot cathode valves, but it intentionally avoids laying down rigidly the exact manner in which any facility should be provided.

The equipment is intended to provide a highly flexible and readily extensible telecontrol system capable of keeping pace with the rapid growth of electricity and gas distribution; as such it would no doubt be of use to other large distribution systems. A number of outstations can indicate to a central station the state of their plant by means of two-state and analogue measurements which are digitized for transmission; control of the plant from the central station is catered for, but may be omitted if desired. Automatic alarm features are included and the central station equipment is arranged to give print-out for data logging if required. The Joint Radio Committee has encouraged the development of this equipment and several manufacturers have shown an interest in meeting the requirements of the fuel and power industries.

Copies of the basic specification may be obtained from G. D. Turton, secretary, Joint Radio Committee of the Nationalized Fuel and Power Industries, c/o Central Electricity Generating Board, Bankside House, Sumner Street, London, S.E.1.

ECSC Sheet Production

Sheet production in the European Coal and Steel Community has increased from 5,000,000 tons in 1954 to 8,600,000 tons in 1959 and 10,300,000 tons in 1960, according to Mr. R. Ganz, commercial director of Huttenwerk Siegerland, Germany. However, the considerable amount of new wide strip capacity planned in Germany and the Community for the next few years is far in excess of the likely increase in requirements.

In this paper, which is translated from Hutnické Listy, 1960, XV, No. 8, pp. 657-669, the author, Miroslav Sicha, first reviews the literature on the influence of production conditions on the hydrogen content of steel. Then, after discussing the properties of liquid and gaseous fuels, with particular reference to the partial pressure of the water vapour in the atmosphere formed by their combustion, he reports on a comparative study of hydrogen in steel melts from furnaces fired with tar oil and gas in two works, one works operating tilting and the other fixed open-hearth furnaces. The article will be concluded in our next issue.

Hydrogen in Basic Open-hearth Steelmaking

Influence of Gas and Tar Oil Firing Compared

THE steelmaking industry employs economically more advantageous firing of steelmaking furnaces by means of liquid fuels to an ever increasing extent.[41] This paper analyses the problem of the quality of steel melted with tar oil, primarily in relation to its hydrogen content, and indicates the order of importance of the factors which in common determine the hydrogen content of the steel.

Tar oil contains more hydrogen than the producer gas which has hitherto been used predominantly, and apart from this it is as a rule atomized with superheated steam. The atmosphere of a furnace fired with oil, therefore, as a rule has a higher partial pressure of water vapour (pH_2O) than the atmosphere of a furnace fired with gaseous fuels.

As the hydrogen content in the melt is to a certain extent dependent on the pH_2O in the furnace atmosphere, the use of tar oil atomized with steam, can be unfavourably manifested by an increased hydrogen content in the steel and a greater occurrence of melts with evidence of flakes, hairline cracks, and other hydrogen phenomena.

In this study an assessment is made of 93 melts of carbon and alloy steels, melted with gas and oil in large, basic furnaces of the Wellman and Talbot types, in which the ore process is worked, and in basic open-hearth furnaces making the steel by the scrap process. The worked melts of carbon steel were finished in the ladle, whereas the melts of alloy steels were for the most part finished in the furnace under a carburized slag.

The results of this study, which was carried out under different conditions, are, of course, also indicative for other works which are changing over to the firing of steelmaking furnaces by means of tar oils.

EFFECT OF PRODUCTION CONDITIONS ON THE HYDROGEN CONTENT OF THE STEEL

Studies of the influence of production conditions on the hydrogen content of the steel have already been the subject of many works.[1-27] According to the generally recognized opinions, which are also confirmed by our own research work,[8, 13, 20] the hydrogen content of a melt is mainly determined by the following:—(1) The content of water vapour in the furnace atmosphere which is primarily determined by the content of hydrogen and of hydrogenous compounds in the fuel; (2) the intensity with which the steel boils, *i.e.*, the rate of carbon drop; and (3) the chemical composition and physical state of the slag.

The theoretical bases by which these factors may be influenced are indicated in the subsequent sections.

Content of Water Vapour in the Furnace Atmosphere

Through contact between water vapour and the liquid steel hydrogen is formed, which immediately dissolves in the nuclear form in the liquid steel up to the equilibrium level; this level is determined by the partial pressure of the water vapour in the furnace atmosphere, by the temperature, and partly also by the chemical composition of the steel. Research into the equilibrium conditions between an atmosphere containing water vapour and liquid steel has been the concern of numerous research workers.[4, 12, 22, 23, 28, 29]

Here are presented results of the work of

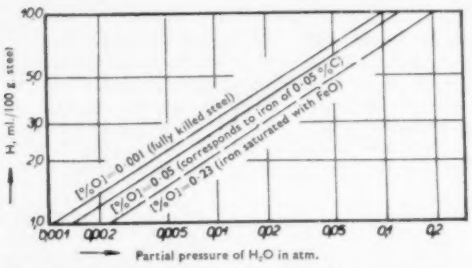


FIG. 1.—HYDROGEN CONTENT OF LIQUID STEEL IN CONTACT WITH AN ATMOSPHERE CONTAINING WATER VAPOUR AT A TEMPERATURE OF 1,600 DEG. C.

Epstein and his collaborators,[22] who compiled a diagram of the hydrogen content in the metal in relation to the oxygen content on reaching equilibrium at various partial pressures of H_2O in the atmosphere of steelmaking furnaces. The diagram assessing the hydrogen contents in ml/100 g steel is shown in Fig. 1.

According to Carney, Chipman, and Grant[40] a somewhat different situation arises in a liquid bath of iron covered with slag. If a mixture of water vapour and inert gas finds its way on to the surface of the slag, the water vapour dissolves in the slag, and on the contact surface between the slag and the bath of metal a higher hydrogen pressure is set up, and this hydrogen does not pass into equilibrium with the hydrogen in the atmosphere, since it cannot rapidly diffuse through the slag. Thus the hydrogen content in the liquid metal under equilibrium conditions attains higher values than in the preceding instance.

A graphical representation of the equilibrium contents of hydrogen in steel covered with slag and pH_2O in the atmosphere is given in the diagram in Fig. 2.

The results of the research carried out by Kerlie and Richards[23] are also very objective. These authors worked out the ratio between the hydrogen content in the bath and the calculated content of water vapour in the furnace atmosphere in two works using different fuels. The results of their work show that with a reduction in the content of water vapour in the furnace atmosphere there was a drop in the hydrogen content in the metal, so that the ratio $H:(H_2O)^{\frac{1}{2}}$ remained about the same at the two works.

Recently in a contribution to a discussion on a lecture of Görgen,[38] Nikolíc affirmed that the hydrogen content in melts heated with oil atomized with steam, rose by about 1ml H/100 g steel as opposed to melts heated with oil atomized with air. As opposed to this Kurochkin *et al*[32] did not establish an increase in the hydrogen content of melts heated with steam-atomized oil. Before tapping, however, their melts had a relatively high hydrogen content within the limits of 6-10.5 ml H/100 g steel.

Intensity of the Steel Boil

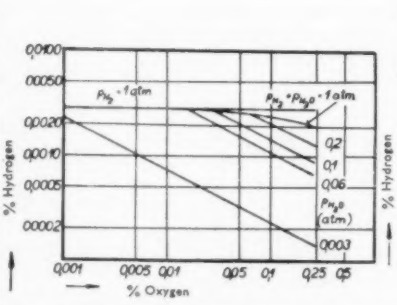
The majority of research workers consider the steel boil to be an important factor which has an influence on the hydrogen content of the steel. During the boiling of the steel CO bubbles form, which initially have a zero partial pressure of hydrogen. Into the bubbles of CO hydrogen diffuses from the liquid steel and here endeavours, in accordance with the Sievert Law, to attain the equilibrium concentration with the hydrogen dissolved in the metal.

From this explanation it is evident that the elimination of the hydrogen from the steel will be all the more effective, the greater is the number of CO bubbles which escape from the bath, and the greater the time during which they are in contact with the molten metal.

During a boil which rises upwards from the bottom of the furnace, the bubbles pass through the whole body of the metal and degasify it better, than during a boil occurring on the boundary between the slag and the metal.

Epstein, Walsh, and King[11] assessed the action of the CO bubbles during the boiling of the steel on the reduction in the hydrogen content of the metal on the assumption that equilibrium is set up between the CO bubbles, the partial pressure of H_2 in the bubbles and the hydrogen content in the metal. By mathematical assessment of these assumptions, they calculated the relationship between the decarburization rate, the time of the boil, and the hydrogen content which under these conditions is liberated from the liquid steel. These calculations are presented graphically in Fig. 3.

And although the calculations mentioned are theoretically correct so far as they go, they do not fully describe the real course of the removal of hydrogen from the bath, since, on the one hand, they do not take into consideration the fact that between the CO bubble and the hydrogen dissolved in the metal the equilibrium state is never reached during the short time of contact, and, on the



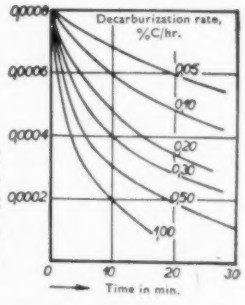


FIG. 2 (LEFT).—MAXIMUM HYDROGEN CONTENT OF CARBON-FREE STEEL UNDER A SLAG IN CONTACT WITH WATER VAPOUR. FIG. 3 (RIGHT).—EFFECT OF THE INTENSITY AND DURATION OF BOILING ON THE HYDROGEN CONTENT OF LIQUID STEEL.

other hand, it does not take into consideration the continuous diffusion of hydrogen from the atmosphere through the slag into the steel. In practice, therefore, it is impossible to obtain the results shown in the diagram.

Chemical Composition and Physical State of the Slag

In our earlier works during 1949 and 1950[8, 13, 20] we drew attention to the fact that changes in the hydrogen content are not always dependent on the intensity of the steel boil, but that it is possible to explain them by the protective properties of the slag, dependent upon its chemical composition and physical state.

In one instance the slag readily absorbs hydrogen, whereas in another instance it slows down the diffusion of hydrogen from the atmosphere, and sometimes directly contributes to a lowering of the hydrogen content in the liquid steel. Our observation was later unconditionally confirmed by Yavoiskii[18], who carried out experiments under the same conditions.

Two explanations have been given of the observed influence of slags on the hydrogen content of steel. The first explanation,[8, 13] in agreement with the opinions prevailing at that time, premises that the passage of hydrogen through the slag into the steel is brought about in the form of the hydrogen ions. These ions react with the oxygen ions in the slag to form inactive molecules.

The oxygen and hydrogen ions in the slag are mutually in equilibrium; this equilibrium is determined by the oxygen ions of the molten slag and, dependent upon their concentration and activity, there is a rise or fall in the hydrogen concentration in the slag and simultaneously in the metal.

In dense or viscous slags it may be assumed that there is greater strength of the inter-ionic, electrostatic, attractive forces, which reduce the concentration and activity of the oxygen ions. As opposed to this, in fluid slags the inter-ionic bond is weakened, and the concentration and activity of the oxygen ions rise.

In conformity with this hypothesis, attention is drawn to the reduction in the hydrogen content under active slags with a high content of FeO, CaF_2 and similarly by slags shaped up with an addition of Al_2O_3. The favourable effect of slags with good fluidity on the hydrogen content of steel has also been pointed out by Katzen[2] and Kuznetsova[10].

According to more recent opinions[9, 34, 43] hydrogen is present in molten slag as the hydroxyl ion OH. During the assessment of the equilibrium constants for the passage of the hydroxyl ions in common with the oxygen ions through the slag into the steel we can reach the same conclusion concerning the influence of the concentration and activity of the oxygen ions in the slag on the hydrogen content in the steel, as I pointed out in a comment on the work of Yavoiskii[33]. These considerations are valid if there is a simultaneous sequence of oxidizing reducing reactions during the production of steel.

The other explanation of the effect of slags on the hydrogen content of the metal[18] can be broken down into these points:—(*a*) The hydrogen content of the metal is dependent on the one hand on the rate of hydrogen diffusion from the furnace atmosphere through the slag into the molten bath; and (*b*) hydrogen penetrates fluid slags more rapidly than viscous slags, therefore, a lower hydrogen content is more readily attained under viscous than under fluid slags.

In this way the favourable effect of magnesium and lime slags is explained, which are usually more viscous than normal slags.[14, 15, 35] And although it is impossible to deny the importance of the rate of hydrogen diffusion from the furnace atmosphere through the slag into the metal, this explanation is inadequate to provide the clarification of all the phenomena observed.[33]

Certain more recent works by Soviet authors again assert the important influence of the chemical composition and of the physical properties of the slag on the hydrogen content of the metal. Barmin *et al*[36] established that the solubility of H_2O in the slag rises with the CaO content, and falls with the replacement of CaO by FeO and MnO.

By measurement it was confirmed that, if oxidizing reducing reactions do not take place between the slag and the bath, then hydrogen is not dissolved in the slag, but on the contrary H_2O, which reacts with the oxygen ions present to form hydroxyl anions in accordance with the equation

$$H_2O_{(vapour)} + O^{--}_{(slag)} = 2\,OH^{-}_{(slag)}.$$

In the slags investigated the activity of H_2O was greatest in the presence of K_2O, and gradually fell in relation to the increasing content of CaO, MnO, FeO, Fe_2O_3, Al_2O_3, and SiO_2. MgO is not mentioned in this list, but in view of the radius of its atom it also considerably reduces the activity of H_2O dissolved in the slag.

These measurements confirm our practical find-

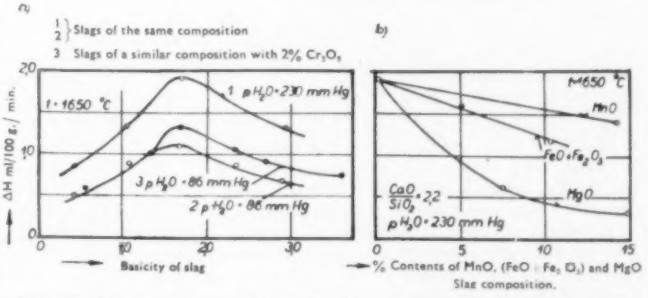


FIG. 4.—EFFECT OF THE BASICITY (*a*) AND OF THE COMPOSITION (*b*) OF THE SLAG ON THE RATE OF HYDROGEN DIFFUSION THROUGH THE SLAG.

ing, that, by the addition of Al_2O_3 and MgO, it is possible to prevent a rise in the hydrogen content of the liquid metal or decrease the extent of the rise.

Bogatenkov *et al*[37] measured the rate of diffusion of hydrogen through molten slags of different chemical compositions, and determined the relationship between the rate of diffusion of hydrogen and the basicity of the slag, on the one hand, and the content of MnO (FeO + Fe_2O_3), and MgO in the slag, on the other hand. The results of the measurements are presented in Fig. 4, and show that the highest rate of hydrogen penetration occurs through slags with a basicity expressed by the ratio CaO/SiO_2 = 1.5-2.0 (Fig. 4*a*).

Slags with a lesser or greater basicity permit the passage of hydrogen at a slower rate. In Fig. 4*b* is shown the influence of the chemical composition of the slag on its permeability to hydrogen. With the increasing content of MnO, FeO, and especially MgO, the rate of hydrogen diffusion through the molten slag is reduced.

The authors mentioned[36, 37] explain the rise in hydrogen permeability of slags by the reduction in the activity of the oxygen ions in the slag. Even though the chemistry of the protective action of basic slags is not unambiguously explained, it is possible to consider it as proved that the chemical composition and physical properties of slags significantly influence the hydrogen content in liquid metal.

METHOD EMPLOYED FOR THE STUDY OF HYDROGEN IN STEEL

For the study of hydrogen in the experimental and comparison melts we used the methods already tried out earlier, which are presented in our preceding articles.[8, 13, 39] The hydrogen content was determined in rapidly cooled specimens of the steel in the form of notched bars cast in special moulds. After the removal of the pouring runner, the specimens were at once packed in carbon dioxide snow, in which they were stored until the analysis was carried out.

The specimens were withdrawn through the central charging doors of the furnace in the same way as preliminary samples are taken for the determination of ordinary elements. In view of the small radius of the hydrogen atom and its high diffusion velocity, it is not necessary to bother about any heterogeneous distribution of hydrogen in the bath, even in furnaces of large dimensions.

The reliability of the determination of hydrogen in rapidly cooled specimens was tested by Carney, Chipman, and Grant.[40] Their experiments showed that during analysis of rapidly cooled specimens of low-alloy steel containing 0.00120 per cent. (13.4 ml H/100 g steel) it is possible to include 80 per cent. of the hydrogen actually present in the liquid steel. In the same steels with a hydrogen content of less than 0.00080 per cent. (9.0 ml/-00 g) it is possible to determine 95 to 100 per cent. of the original hydrogen in the liquid steel. For austenitic steels this sampling technique is accurate up to a content of 0.00120 per cent. H.

For the determination of the hydrogen content of steel heated in vacuo we have already assembled equipment earlier, which has proved itself very satisfactory in daily use over a period of 11 years. With this equipment it is possible to determine the content of atomic hydrogen and the total content of gases in metals melted in vacuo; the vacuum system and micro-analyser of this equipment are in both instances the same. A diagram and description of the equipment have already been published in our previous articles.[13, 39]

THE STUDY OF HYDROGEN IN STEEL MELTS FROM FURNACES FIRED WITH GAS AND TAR OIL

Properties of the Fuels Employed and a Comparison of these Properties

For firing steelmaking furnaces use is made in our steelworks of producer gas, coke-oven gas, and mixed gas, and recently also of tar oil "A." Since this work is concerned above all with the conditions for the use of tar oil, its properties will be described first.

Tar Oil "A"

Quality "A" tar oil is a by-product of the hydrogenation of brown coal tar oils. The average properties of the tar oil are shown in Table 1.

TABLE 1.—*Average Values of Tar Oil "A."*

Properties.	Average value from 21 specimens.
Density at 20 deg. C.	1.035
Viscosity, deg. E./100 deg. C.	2.23
Flash point, deg. C.	163
Gross calorific value, kilocal/kg.	9,532
Net calorific value, kilocal/kg.	9,042
Water content, per cent.	0.65
Sulphur content, per cent.	0.58
Content of solid materials*	0.50

* Insoluble in a mixture of three parts benzene and one part alcohol.

At normal temperatures the tar oil is very viscous and non-volatile; with increasing temperature its viscosity falls to about 1.2 deg. E at 150 deg. C. On heating to 200 deg. C. the oil starts to distil, and at 350 deg. C. it begins to decompose. Chemical analysis of the tar oil produced the following results (percentage weight):— 84.24 C, 9.00 H, 0.62 N, 0.46 S, 0.15 ash, and 0.65 water.

TABLE 2.—*Theoretical Composition of the Atmosphere on Complete Combustion of the Tar Oil with Air and on Atomizing One Part by Weight of the Oil with 0.6 Part by Weight of Steam.*

Chemical composition of atmosphere.	Oil and air.			One part oil: 0.6 part steam.		
	Per cent. by vol.	Partial pressure.		Per cent. by. vol.	Partial pressure.	
		mm. Hg.	Atm.		mm. Hg.	Atm.
CO_2	15.1	115	0.151	14.1	107	0.141
H_2O	9.7	74	0.097	15.8	120	0.158
N_2	75.1	571	0.751	70.1	543	0.701
SO_2	0.03	0.2	0.0003	0.02	0.2	0.0002

For combustion of 1 m. ton oil theoretically 9,871 m.³ air are required.

TABLE 3.—*Average Chemical Compositions of Gaseous Fuels and of the Atmosphere which is Formed Through their Combustion with the Theoretical Quantity of Air.*

Chemical composition of gas.	Producer gas at works A.	Producer gas at works B.	Coke-oven gas.	Mixed gas.
	Per cent. by volume.	Per cent. by volume.	Per cent. by volume.	Per cent. by volume.
CO_2	3.7	3.7	3.5	5.5
C_nH_{n+2}	0.6	0.6	2.7	0.5
O_2	0.2	0.2	0.1	0.2
CO	26.4	26.2	10.9	28.1
H_2	14.3	16.2	49.4	10.7
CH_4	1.8	1.8	22.4	3.5
N_2	53.0	51.3	11.0	51.4

Chemical composition of atmosphere.	Producer gas at works A.			Producer gas at works B.			Coke-oven gas.			Mixed gas.		
	Per cent. by vol.	Partial pressure.		Per cent. by vol.	Partial pressure.		Per cent. by vol.	Partial pressure.		Per cent. by vol.	Partial pressure.	
		mm. Hg.	Atm.		mm. Hg.	Atm.		mm. Hg.	Atm.		mm. Hg.	Atm.
CO_2	16.3	124	0.163	15.8	120	0.158	8.9	68	0.089	17.8	135	0.178
H_2O	9.7	74	0.097	10.3	78	0.103	21.6	164	0.216	9.0	68	0.090
N_2	74.0	562	0.740	73.9	562	0.739	69.5	528	0.695	73.2	557	0.732
Theoretical requirement of air for combustion of one volume of gas.	1.231 times volume.			1.281 times volume.			4.01 times volume.			1.331 times volume.		

On complete combustion of the oil with the theoretical quantity of air an atmosphere is created, the chemical composition of which is shown in Table 2 in volumetric percentages. In this table is also shown the theoretical chemical composition of the atmosphere which is formed on complete combustion of the oil, when atomized with steam, added in the proportion of one part by weight of oil to 0.6 part by weight of steam.

The quantity of air required was calculated from the oxygen theoretically required for complete combustion of the combustible components of the oil on the assumption that the air contains on average 78.06 per cent. nitrogen, 21.00 per cent. oxygen, and 0.94 per cent. argon (volumetric percentages), with traces of other accompanying elements.[44]

The average chemical compositions of the other gaseous fuels, as well as of the atmospheres which are formed by their combustion with the theoretical quantity of air, are given in Table 3.

Comparison of Tar Oil and Gaseous Fuels for Steelmaking Furnaces

Although tar oil "A" contains approximately five times as much hydrogen by weight, and about 2.5 times as much, if calculated in volumetric percentages of the gasified oil, as producer gas, its combustion with the theoretical quantity of air produces an atmosphere with approximately the same partial pressure of water vapour as that produced by producer gas (compare Tables 2 and 3).

This phenomenon may be explained by the fact that the tar oil contains for the most part combustible components, and for its combustion a much greater quantity of air is required than for the combustion of producer gas, which contains only 42 to 45 per cent. by volume of combustible components. Through the introduction of a greater quantity of air and the formation of a greater volume of combustion products the partial pressure of H_2O in the resultant atmosphere is diminished.

If the tar oil is atomized with steam, the partial pressure of H_2O in the furnace atmosphere will rise by about 6 per cent. by volume (Table 2) by comparison with the atmosphere in a furnace fired with producer gas. According to Fig. 1 the rise in pH_2O in the furnace atmosphere from 0.097 to 0.158 atm. corresponds to an increase in the limiting content of hydrogen in the steel of about 2.5 ml H/100 g, on the assumption that the equilibrium state is reached.

In the combustion products of the gaseous fuels the maximum partial pressure of water vapour in the atmosphere of the burnt coke-oven gas is 0.216 atm. The mixed gas, in its chemical composition and atmosphere after combustion, approximates to the producer gas. The partial pressure of the water vapour in the atmosphere of burnt mixed gas amounts to 0.090 atm. Mixed gas is used for the heating of steelmaking furnaces as a rule only in conjunction with coke-oven gas.

The figures presented in the preceding tables and comparisons have only relative importance. In reality the pH_2O in the atmosphere of steelmaking furnaces is reduced by the fact that combustion of the fuels takes place in an excess of air, but the quantity of H_2O in the atmosphere can be increased by the humidity of the air introduced or even of the gas alone.

During further calculations consideration will be given to the production conditions of the combustion of the fuels in steelmaking furnaces, so that the calculations subsequently carried out shall approximate to the real conditions during the production of steel.

Study of Hydrogen in Melts from the Steelmaking Furnaces at Works A

Characteristics of the Steelmaking Furnaces

Control melts were produced in basic tilting furnaces of the Wellman and Talbot type, in which for the most part a charge of liquid pig-iron is worked. The furnaces were fired either with producer, coke-oven, or mixed gas, or, on the other

hand, with tar oil atomized with air or steam.

During pumping from the storage tanks the tar oil is heated up to 80 deg. C. and, before entering the burner nozzles, is heated with superheated steam to about 150 deg. C. When the oil is atomized with steam, 0.6 of a part by weight of superheated steam is added to one part by weight of oil.

In Table 4 are shown certain parameters of the steelmaking furnaces, in so far as they relate to the problem under study.

TABLE 4.—*Certain Details of the Steelmaking Furnaces at Works A, in which the Controlled Melts were Worked.*

Designation.	Weight of charge. m. tons.	Hearth area, m^2.	Hearth loading. m. tons/m^2.
I	170	39.54	4.3
II	145	39.54	3.8
III to VII	260	53.65	4.8

Experimental and Comparison Melts

The study of hydrogen was carried out on 16 melts of Cr-Mo steel in accordance with Czechoslovak State Standard (CSN) 15421, from which heavy ingots were cast for forging boiler shells. The experimental melts were worked in steelmaking furnaces Nos. I and II fired with oil atomized with unheated air at a pressure of 4 to 5 atm.

Atomization with air was employed in view of the tendency of this type of steel to flake. The comparison melts were worked in the same steelmaking furnaces at a time when these furnaces were fired with gaseous fuels.

At the end of the meltdown period the melts were dephosphorized with repeated additions of lime and ore. The fluidity of the slag was shaped up with bauxite. The slag was tapped off several times during working. The carbon content fell to a level at which its required quantity was reached after the additions.

The next operation was so-called "diffusion deoxidation," during which coke breeze in an amount of about 3 kg. per m. ton of steel was evenly scattered on to the slag, and about 0.15 per cent. Si was added to the furnace in the form of SiMn, and the whole of the FeCr. (In reality there is no question of "diffusion deoxidation" of the steel, but rather of partial deactivation of the slag, in which the residual FeO is eliminated, as has already been shown earlier.[31] This does not cause deoxidation of the steel.) About 40 min. after the addition of the FeCr, the furnace was tapped into the ladle, into which the required FeSi, CaSi, and Al were added.

In addition, two melts of Mn-V steel in accordance with CSN 13123 and one melt of Mo-Ti steel in accordance with CSN 15223 were investigated with the same aims as for the preceding melts.

The experimental melts mentioned were worked in steelmaking furnaces Nos. I and II, fired with oil which was atomized with steam. The comparison melt of Mn-Cr-V steel was worked in furnace No. II at a time when this furnace was fired with gaseous fuels. All the melts were worked accordingly to the same technical instructions and finished under a carburized slag with a moderately short time of melting of the alloying additions.

Apart from the melts of alloy steel indicated, here an assessment was also made of five experimental melts of carbon steel, melted with oil fuel atomized with steam in steelmaking furnaces Nos. I, II, and V. Five additional comparison melts were worked in the same types of steelmaking furnaces fired with gaseous fuels.

Control of the Experimental and Comparison Melts

From the experimental and comparison melts samples of the steel were as a rule taken after the meltdown period, at the start of the pure boil,* and before tapping, while casting samples were

* TRANSLATOR'S NOTE.—Czechoslovak terminology to denote phases of steel melts, like that of other Slav languages, includes many terms for which there is no generally accepted English equivalent. The term "pure boil" denotes the turbulence which results from the reaction of carbon with all the reducible oxides (oxidizing oxides, FeO, MnO, etc.) in the melt. In contrast to this we have the "ore boil," which is the turbulence arising after the addition of feed ore.

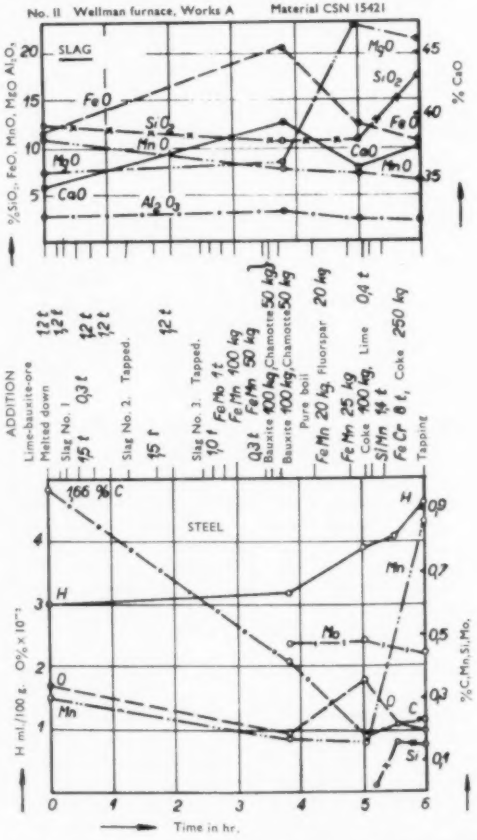


FIG. 5.—SEQUENCE OF MELT NO. A13, MELTED WITH GASEOUS FUELS.

taken half-way through the casting of the ingots.

From the melts finished under a carburized slag, apart from those previously indicated, samples of the steel were also taken before the addition of the coke and 15 min. after the addition of FeCr.

As a rule a complete analysis was carried out for the ordinary elements, and, in addition, the contents of atomic hydrogen, oxygen, and nitrogen were determined.

Slag samples were taken at the same time and on these a complete chemical analysis was carried out. On the control melts of carbon steel only the final slag was analysed.

On melts of alloy steel the temperature of the bath was investigated during the course of working by means of immersion thermocouples. In certain instances measurements were also made at the same time of the temperature of the slag.

The delivery of oil, steam, gaseous fuels, and air to the steelmaking furnaces was recorded on the basis of the daily consumptions. The chemical composition of the coke-oven and mixed gas was assessed from the average values of the chemical analyses obtained at works A (Table 3); composition of the producer gas was determined by chemical analysis of a sample taken on that day on which the control melts were worked.

At the same time data were established concerning the overall nature of the weather, air pressures, and temperatures, the pressure of water vapour in the air and its relative humidity at the time of working of the control melts. The data obtained served for the assessment of the atmosphere in the steelmaking furnace.

Results of the Experiments and their Assessment

(*a*) *Melts of Alloy Steels, Fired with Oil and Gas.*—A characteristic sequence of working a melt of Cr-Mo steel is shown in Fig. 5. The average contents of gases in the experimental and comparison melts are given in Table 5. As the table shows, no difference in the average content of hydrogen was established between the melts produced with fuel oil atomized with air or steam, and the melts produced with gaseous fuels.

Noteworthy is the average fall in the hydrogen content in the period between tapping and casting in the comparison melts, and, on the contrary, the increase in the hydrogen content in the experimental melts. The varying humidity of the air and the concomitant humidity of the casting refractories, however, contributed to this different behaviour of the hydrogen. The effect of the humidity of the air on the hydrogen content during casting will be discussed later.

The average content of oxygen during the course of refining is lower in all the comparison melts than in the experimental melts. This circumstance may be explained by a more oxidizing furnace atmosphere during the production of the experimental melts. The theoretical excess of oxygen in the atmosphere of the experimental melts amounted on average to 3 per cent. O_2, and to 4.95 per cent. O_2 in the comparison melts. For these calculations no account was taken of the consumption of oxygen for combustion of the CO forming during the boiling of the steel. It is assumed that this consumption was approximately the same for all the melts.

The average nitrogen content in the experimental melts varied within the normal limits. During the course of the ore boil and the pure boil the nitrogen content fell, while during the holding of the melt under a carburized slag it again rose considerably.

The results of the study of gases in melts produced with tar oil and heating gases were verified also by the results of mechanical tests on heat treated, forged boiler bodies of Cr-Mo steel according to CSN 15421. On the ends of each forging corresponding to the top and bottom of the ingot, six to 14 tensile tests were carried out at normal temperatures, two to four tensile tests at 300 deg. C., and six to 12 notch impact strength tests.

Classification of the melts was carried out by calculation of the quality factor, which represents a combination of the tensile strength, the reduction in area, and the elongation. The quality factor is indicative of the plastic properties of a material, and these are appreciably influenced by the content of gases, and especially of hydrogen.

The comparison melts have an average quality factor of 140.4 at normal temperatures and 131.6 at 300 deg. C., *i.e.*, higher than the experimental melts with an average quality factor of 137.6 at normal temperatures and 130.3 at 300 deg. C. More detailed analysis shows that the reduction in area, predominantly influenced by hydrogen, is decreased to a greater extent in the experimental melts than the elongation which is influenced by oxygen.

It is necessary to take into account, however, that the hydrogen content of the ingot is gradually decreased under the influence of its soaking, heat treatment, and storage. In so far as a higher hydrogen content is not manifested in the forging by flakes or other faults which are difficult to

TABLE 5.—*Average Content of Gases in the Experimental and Comparison Melts.*

Sample taken.	Experimental melts, oil-air.			Experimental melts, oil-steam.			Comparison melts, (gas).	
	ml H 100 g.	O per cent.	N per cent.	ml H 100 g.	O per cent.	N per cent.	ml H 100 g.	O per cent.
After meltdown	2.6	0.020	0.006	—	—	—	2.7	0.014
Start of pure boil	3.8	0.025	0.005	2.6	0.016	0.004	3.1	0.020
Before addition of coke	3.9	0.025	0.004	3.0	0.027	0.004	3.7	0.022
15 mins. after addition of FeCr	4.4	0.017	0.005	—	—	—	—	—
Before tapping	4.8	0.017	0.006	4.9	0.016	0.005	4.8	0.010
1st cast, after pouring	5.8	0.012	0.007	5.4	0.008	0.006	4.5	0.008
2nd cast, after pouring	5.8	0.010	0.007	5.2	0.009	0.007	—	—

remove, then the harmful effect of hydrogen on the mechanical properties is steadily reduced. The higher oxygen content of the experimental melts was manifested by a somewhat lower average elongation and notch impact strength.

The uniform increase in the content of hydrogen and nitrogen and the constant level of the oxygen content during the course of the "diffusion deoxidation" of the experimental and the comparison melts provided grounds for a proposal to shorten the time of holding of the melt under a carburized slag. The suggestion is supported, on the one hand, by the experience of Morozov[47], and on the other by the thermal balance of the melts after the addition of FeCr. Morozov recommends that melts should be held in the furnace after the addition of FeCr for varying periods dependent on the C content of the FeCr; the recommended times are shown in Table 6. The FeCr used in the production of the type of steel under study contains as a rule 0.6 per cent. C.

TABLE 6.—*Holding Time of a Melt in the Furnace After the Addition of FeCr in Relation to its C Content.*

C content, per cent. in the FeCr.	Under 1·5	2·5	3·6	5·0
Holding time in the furnace, min.	15	20	25	30

For the calculation of the thermal balance of the furnace and of the loss through combustion of the additions, use was made of the measured values for melt No. A2. A detailed calculation of the consumption of heat for heating and melting the additions and the heat transfer through the cooling of the bath after the additions were made, including the transfer of heat through oxidation of Si, Cr, and Mn, showed that 15 min. after the addition of FeCr the melt is already in thermal equilibrium, which is evidence of the fact that this length of time is sufficient for complete melting of the additions. Again, measurement of the temperatures for the subsequent melts confirmed this finding.

Appropriate shortening of the time of holding a melt under a carburized slag could shorten the production time of the melt, prevent the increase in the content of gases, and reduce the loss through oxidation of the additions.

Special attention was aroused by the often considerable rise in the hydrogen content of the steel in the period between the tapping of the melt from the furnace and its casting from the ladle. For this reason control of the hydrogen in the last four experimental melts was extended right up to the pouring of the steel out of the tundish. The results of this investigation are shown in Table 7.

TABLE 7.—*Changes in the Hydrogen Content of Steel Between Tapping from the Furnace and Casting into Ingots.*

No. of melt.	Furnace specimen, ml H/100 g steel.	Ladle specimen, ml H/100 g steel.	Tundish specimen, ml H/100 g steel.
A 9	5.3	5.5	6.0
A 10	4.6	5.6	
		5.3	5.2
		5.4	
A 18	—	4.8	4.3
		5.1	
A 19	4.8	5.5	4.4

More detailed research into the relationship between the hydrogen content in the ladle and the pressure of the water vapour in the atmosphere, showed that the changes in the hydrogen content in the ladle, and especially in the tundish, are determined to a significant extent by the humidity of the air and by the concomitant humidity of the chamotte casting refractories.

A graphical assessment of this relationship, which contrasts the experimental and comparison melts, is shown in Fig. 6. The relatively considerable fluctuation and the grouping of the points for the experimental melts in the upper part of the diagram and of the points for the comparison melts in the bottom part of the diagram, show that here a considerable part can also be played by the method of drying the ladles before their use.

The correlation factor of the points[48] in the diagram amounts to 0.605. The drop in the hydrogen content of steel which is not covered by slag is not, however, dependent solely on the partial pressure of the water vapour in the air, but is also brought about by the capillary condensation of the water vapour into the porous surface of the refractory material in the vicinity through saturation of the air with water vapour. Under these conditions the adsorption isotherm records an abrupt rise in the concentration of the humidity adsorbed by the refractory lining of the ladle, which then becomes a source of increase in the hydrogen content of the steel.

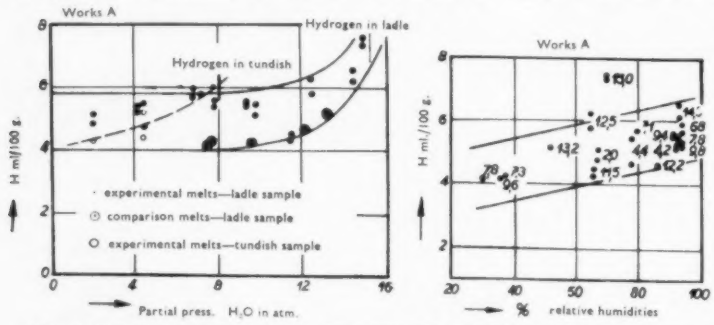


FIG. 6 (LEFT).—EFFECT OF THE PRESSURE OF THE WATER VAPOUR IN THE ATMOSPHERE ON THE HYDROGEN CONTENT OF THE STEEL IN THE LADLE AND THE TUNDISH WORKS A. FIG. 7 (RIGHT)—EFFECT OF THE RELATIVE HUMIDITY OF THE AIR ON THE HYDROGEN CONTENT IN THE LADLE. NUMBERS AGAINST THE PLOTS INDICATE THE PARTIAL PRESSURE OF THE WATER VAPOUR IN THE ATMOSPHERE, EXPRESSED IN MM. HG.

The important influence of the capillary condensation of the water vapour is displayed in Fig. 7, which illustrates the relationship between the hydrogen content and the relative humidity of the air for the same melts as in Fig. 6.

(*b*) *Melts of Carbon Steels Fired with Oil Atomized with Steam.*—The results obtained for the melts of alloy steels were verified by an investigation of five melts of carbon steel, melted with oil atomized with steam, and five melts melted with gaseous fuels. During the investigation melts of steel of different quality were produced. All the melts were conducted in such a way that after dephosphorization of the bath the carbon content of the steel fell to 0.30 per cent. for the hard quality steels and proportionately lower for the mild steels, and after tapping into the ladle the melts were deoxidized with liquid FeMn, or FeSi, and Al, and were carburized according to the type of steel produced. Steels of quality CSN 12061 were tapped from the furnace at a C content under 0.50 per cent.

A typical sequence of the working of the carbon steels is shown graphically for melt No. A25 in Fig. 8. The average results of the experimental and comparison melts are given in Table 8. These

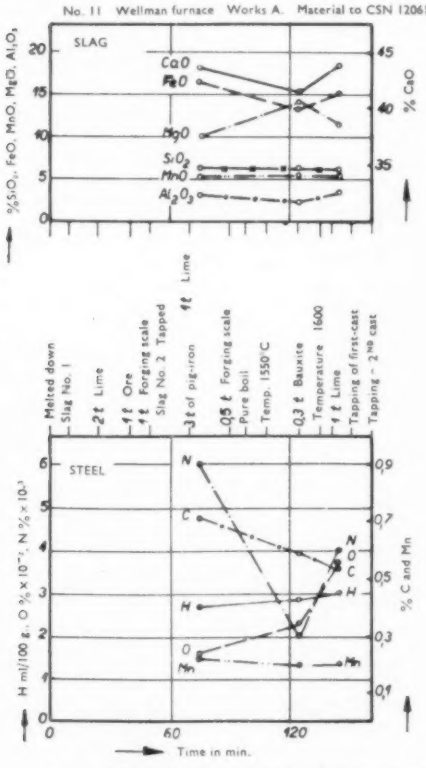


FIG. 8.—SEQUENCE OF HEAT NO. A25, MELTED WITH STEAM ATOMIZED OIL.

TABLE 8.—*Comparison of the Average Results of Experimental and Comparison Melts of Carbon Steel.*

Sample taken.	Experimental melts (oil).			Comparison melts (gas).		
	ml H/100 g.	O per cent.	N per cent.	ml H/100 g.	O per cent.	N per cent.
After the meltdown	2.0	0.026	0.005	2.5	0.026	0.006
Start of pure boil	2.5	0.027	0.004	2.5	0.022	0.006
Before tapping	2.4	0.030	0.004	2.8	0.028	0.005
Casting sample	3.7	0.008	0.006	4.3	0.012	0.008

results confirm the previous finding, that in the experimental melts, fired with oil atomized with steam in tilting furnaces the hydrogen content reached is not higher than in the melts produced in furnaces fired with gaseous fuels.

With the aim of a more detailed determination of the causes of this phenomenon a calculation was made of the chemical composition of the furnace atmosphere on the basis of the results which were available for this purpose. For the calculation, account was taken of the content of water vapour formed by the combustion of the fuel, the humidity of the air introduced into the furnace, and, where appropriate, the quantity of steam with which the oil was atomized. The consumptions of fuel and air were calculated from the daily consumptions. During melting with oil atomized with air, the partial pressure of the water vapour in the furnace atmosphere varied in relation to the humidity of the air between 0.070 up to 0.082 atm. During melting with oil atomized with steam, pH_2O varied from 0.11 up to 0.119 atm. In the steels melted with gaseous fuels, pH_2O in the atmosphere was determined primarily by the input of coke-oven gas and varied within the limits of 0.094 to 0.130 atm.

Since the melting shop at works A fires the steelmaking furnaces with a large proportion of coke-oven gas, an atmosphere rich in water vapour is formed in these furnaces during the time when they are fired with gaseous fuels. If the furnaces are fired with oil atomized with air, the proportion of water vapour in the atmosphere is decreased.

If the steelmaking furnaces at works A are fired with oil atomized with steam, then the proportion of water vapour in the atmosphere approaches the upper limit of its existence during the firing of the furnace with gases rich in coke-oven gas, without exceeding this limit.

These calculations confirm the experimental results, according to which the hydrogen content in the experimental and comparison melts is the same, or for the carbon steels even in fact higher than in the comparison melts.

Comparison of pH_2O in the furnace atmosphere with the hydrogen content at the end of the pure boil and before tapping did not reveal any significant connection. This fact may be based on the relatively small contact area between the molten steel and the slag, on the one hand, and the atmosphere (see Table 4); this restricts the diffusion of hydrogen from the atmosphere into the steel, and

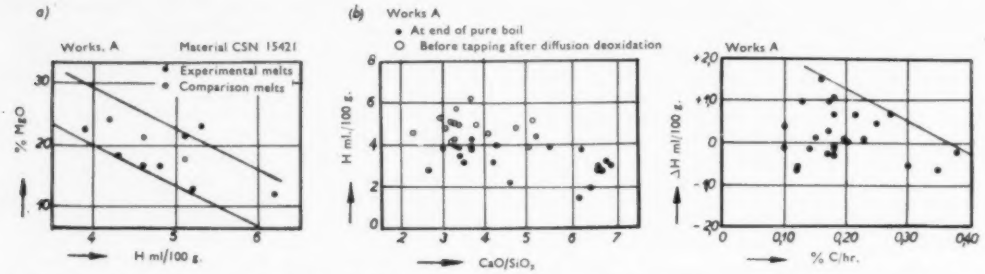


FIG. 9.—(*a*) RELATIONSHIP BETWEEN HYDROGEN CONTENT BEFORE TAPPING AND MgO CONTENT IN THE FINAL SLAG. (*b*) RELATIONSHIP BETWEEN HYDROGEN CONTENT OF THE STEEL AND THE BASICITY OF THE SLAG EXPRESSED BY THE RATIO CaO/SiO_2. FIG. 10 (RIGHT).—INTENSITY OF THE BOIL AND CHANGES IN THE HYDROGEN CONTENT.

has the result that the hydrogen contents of the steel are far from being in equilibrium with pH_2O in the atmosphere. A further reason is the stronger, initial layer of protective slag. An average of 177 kg lime per 1 m² of the surface of the bath is charged into the steelmaking furnaces during the production of alloy steels.

At this juncture it is important to point out that during the production of Cr-Mo or Mn-V steels an average of a further 90 kg lime and 27 kg bauxite are added to the steelmaking furnace, apart from ore and other additions. At an average content of 4 per cent. hydrate water in the lime, established earlier at our works[8], with the lime alone about 0.04 per cent. hydrogen, *i.e.*, 448 ml H/100 g steel, is added to the furnace. Bauxite contains much more hydrate water (about 10 per cent), and, nevertheless, these additions in no way influence the hydrogen content in the bath of the furnaces mentioned, which is lower than for instance in the open-hearth furnaces at works B where the additions of lime are smaller. This finding again confirms the result of our earlier observations, that the normal humidity of the additions does not significantly influence the hydrogen content in the oxidizing period of melts.[8, 13, 20]

The final slags during the production of alloy steels contain approximately 18.6 per cent. MgO, which originates from the magnesite lining of the furnace. According to our earlier information,[8, 13] a higher MgO content of the slag contributes to a lower hydrogen content in the steel.

In the diagram in Fig. 9*a*, the hydrogen content was assessed in relation to the MgO content in the final, carburized slags. In the diagram are assessed only Cr-Mo melts, which have the same sequence of finishing. The connection between the MgO content of the slag and the hydrogen content of the steel is expressed by a correlation factor $r = -0.616$, which indicates the importance of the relationship indicated. Effective MgO contents of the slag are around 20 per cent. MgO.

The influence of the basicity of the slag, expressed by the ratio CaO/SiO_2, on the hydrogen content of the metal is less important. In Fig. 9*b* a marked relationship must be assessed especially at the end of the pure boil and especially before tapping from the furnace. From this point of view in the diagram in Fig. 9*b* a discernible relationship is shown between the rising basicity of the slag and the gradual fall in the hydrogen content at the end of the pure boil, but there is practically no such relationship after "diffusion deoxidation."

The correlation factor of the points assessing the end of the pure boil is $r = -0.45$, corresponding to a higher degree of permeability of the slag.

The intensity of the boil, *i.e.*, the rate of carbon drop, likewise does not have an important influence on the final hydrogen content. In Fig. 10 is indicated the relationship between the changes in the hydrogen content during the course of the pure boil and the intensity of the boil, expressed by the reduction in carbon in per cent. C/hr. The diagram shows that at a low intensity of the boil the hydrogen for the most part increases, but can also decrease. As opposed to this at an intensity of the boil of over 0.30 per cent. C/hr. only the hydrogen content falls. Such a rate of decarburization occurred only rarely in the melts assessed, and was recorded only for three out of the 22 controlled melts; the average rate of decarburization of the controlled melts is 0.20 per cent., and their critical decarburization rate amounts to 0.17 to 0.19 per cent. C/hr. according to Yavoiskii[9].

(To be continued)

LITERATURE REFERENCES

[1] H. Schenck, "Introduction to the Physical Chemistry of Iron and Steel Processes" (Einführung in die physikalische Chemie der Eisenhüttenprocesse), Vol. II, Berlin, 1934.
[2] L. Katsen and A. Bulavkin, Stal, 1940, No. 10, p. 16.
[3] P. Gerasymenko and P. Dombrovskii, Arch. Eisenhuttenwes., 1940-41, XIV, p. 109.
[4] D. J. Carney, J. Chipman, and N. J. Grant, Proc. Electr. Furn. Steel Conf. Amer. Inst. Min. Metal Eng., 1948, VI, pp. 34-45.
[5] H. Wentrup, H. Fucke, and O. Reif, Stahl und Eisen, 1949, LXIX, No. 4, p. 11.
[6] F. Kinsky, Hutnicke Listy, 1949, IV, No. 7, p. 201; No. 8, p. 241; and No. 9, p. 277.
[7] S. F. Carter, J. Metals, 1950, p. 30.
[8] M. Sicha, "Study of the Problems of Hydrogen in Steel" (Studium problému vodíku v oceli), Parts I and II, Vyzk. zpráva VZKG No. 49L-50311, 1950.
[9] V. I. Yavoiskii, "Gases in the Baths of Steel Melting Furnaces" (Gazy v vannakh staleplavilnykh pechei), Metallurgizdat, 1952.
[10] M. V. Kuznetsova, Stal', 1952, No. 5, p. 403.
[11] H. Epstein, J. H. Walsh, and T. B. King, Regional Technical Meeting Amer. Iron Steel Inst., 1954, pp. 25-47.
[12] A. N. Morozov, "Hydrogen and Nitrogen in Steel" (Vodík a dusík v oceli), SNTL, Prague, 1953.

[13] M. Sicha, Hutnicke Listy, 1953, VIII, No. 1, p. 14, and No. 2 p. 73.
[14] M. N. Dobrokhotov, D. J. Povolotskii, and B. Ch. Chan, Stal' 1953, No. 9, p. 796.
[15] S. M. Gnutsev, F. V. Kozlov, and G. K. Komisarov, Stal', 1953, XIII, No. 12, p. 1091.
[16] E. Piper, H. Hagedorn, and H. Backe, Stahl und Eisen, 1953, LXXIII, No. 13, p. 817.
[17] S. L. Levin, N. M. Chaiko, and M. P. Kuznetsov, Stal', 1954, XIV, No. 2, p. 129.
[18] V. I. Javoiskii, Stal', 1954, XIV, No. 10, p. 899.
[19] V. I. Javoiskii, Stal', 1955, XV, No. 6, pp. 506-513.
[20] M. Sicha, Hutnik (Prague), 1955, V, No. 10, pp. 302-305.
[21] A. L. Bogorodskii and V. L. Noskova, Stal', 1957, No. 2, pp. 182-183.
[22] H. Epstein, J. Chipman, and N. J. Grant, J. Metals, 1957, IX, No. 4, pp. 597-608.
[23] W. L. Kerlie and J. Richards, AIME, J. Metals, 1957, IX, No. 11, pp. 1541-1548.
[24] K. T. Kurotskin, D. K. Butakov, P. V. Umrikhin, and B. A. Braun, Izv. VUZ chrn. Metallurg, 1958, No. 1, pp. 34-40.
[25] N. Chvorinov, Hutnické Listy, 1958, XIII, No. 5, pp. 402-406. (Translation No. MT 09).
[26] " Hydrogen in Steel " (Vodík v oceli), SNTL, Prague, 1958.
[27] H. Neuhaus, Stahl und Eisen, 1958, LXXVIII, No. 11, p. 750.
[28] M. N. Dastur and J. Chipman, J. Metals, 1949, CLXXXV, p. 441.
[29] N. A. Gocken, J. Metals, 1956, VIII, No. 11, pp. 1558-1567.
[30] M. Sicha, Final report on a research task (Záverečná zpráva vyzkumného úkolu), No. 41-01-471, VZKG, 1953.
[31] M. Sicha, Contribution of the symposium " Problems and Prospects of Our Metallurgy and Foundry Industry," pp. 305-314. (Problémy a vyhledy naseho hutnictví a slévárenství), SNTL, Prague, 1956
[32] K. T. Kurochkin, B.A. Baum, *et al.*, Metallurg, 1959, No. 3, p. 16.
[33] M. Sicha, Comment on the article of V. I. Yavoiskii, Hutnické Listy, 1956, XI, No. 6, pp. 401-402.
[34] O. A. Yesin and P. V. Geld, " Physical Chemistry of Pyrometallurgical Processes " (Fyz. Khimiya pirometal. protsessov), Part II.
[35] N. J. Shirkov, Stal', 1953, No. 7, p. 611.
[36] L. N. Barmin, O. A. Yesin, and S. K. Chuchmarev, Izv. YUZ chern. metallurgiya, 1958, No. 6, pp. 65-73.
[37] V. F. Bogatenkov, K. T. Kurochkin, and P. V. Umrikhin, Izv. VUZ chern. metallurgiya, 1958, No. 8, pp. 13-20.
[38] R. Görgen, Stahl und Eisen, 1959, LXXIX, No. 21, p. 1491.
[39] M. Sicha, Hutnické Listy, 1951, VI, No. 10, pp. 470-484; No. 12, pp. 590-593.
[40] D. J. Carney, J. Chipman, and N. J. Grant, Trans. AIME. J. Metals, 1950, CLXXXVIII, pp. 180 and 404.
[41] L. Seft, Hutnické Listy, 1959, XIV, No. 3, pp. 185-188.
[42] F. Erdman-Jesnitzer, Hutnické Listy, 1956, XI, No. 7, p. 424.
[43] M. Sicha, " Gases in Steel " (Plyny v oceli), Candidate's Treatise.
[44] E. Votocek, " Anorganic Chemistry " (Anorg. chemie), Cs chem. společnost, Prague, 1925.
[45] L. Kodrle, Final report on a research task (Záverečna zpráva vyzk. úkolu), No. 39-11-499, 1954.
[46] J. Kaspar, " Steel Industry " (Ocelářství) Učební texty vysokych skol, 1954.
[47] A. N. Morozov and A. I. Stroganov, " Deoxidation in Steel in an Open-Hearth Furnace " (Desoxydace v oceli v Martinové peci), SNTL Prague, 1957.
[48] J. Janko, Jak vytváří statistika obrazy sveta a zivota. Sv. 26 JCMP, 1947.

STEEL HOUSE, EASTCOTE

LONDON offices of Steel & Company, Limited, Sunderland, and its associated companies are now housed under one roof. The new headquarters is an attractive three-storey building, Steel House, at Eastcote (Middx).

Companies in the group at Steel House are:—Steel & Company, Limited; Steels Engineering Products, Limited; Steels Engineering Installations, Limited; Steels Process Plants, Limited; Archibald Low & Sons, Limited; R. H. Neal & Company, Limited; Pelapone, Limited; F. Taylor & Sons (Manchester), Limited, and the British Crane Company, Limited. Sales operations for all these companies will now be organized from Steel House. Sixty-five individual offices provide excellent working conditions for the executives and staff, while additional facilities include a lecture and film room for sales refresher courses and conferences, a conference suite and board room for use by visiting directors and senior executives, and staff canteens and rest rooms.

Eastcote, a pleasant and comparatively newly developed town between Harrow-on-the-Hill and Ruislip, is easily reached from London—on the Metropolitan Line from the City and the Piccadilly Line from the West End. Proximity of Eastcote to London Airport was an important factor which influenced the location of Steel House.

New Format for Inco-Mond Magazine

No. 17, the latest issue of Inco-Mond Magazine, has increased its page size to the continental pattern, 8¼ in. by 10⅝ in., and also adopted a modern easy-to-read layout which combines an attractive appearance with an economical usage of available space. This page size is already in use for the foreign-language editions of the magazine, which appear in French, German, and Italian. The magazine is sent to more than 20,000 names in the UK and to more than 6,000 names in the Commonwealth and English-speaking territories oversea. The latest issue includes many articles on the diverse uses of nickel-containing materials. The magazine is obtainable free on request from the Publicity Department, International Nickel Company (Mond), Limited, Thames House, Millbank, London, S.W.1.

OPEN-CAST COAL MINING IN CANADA

PRODUCING about 300,000 tons of coal per year, the coal mine of the Miramichi Lumber Company, Minto, New Brunswick, owned by the International Paper Company, of New York, and affiliated to the Canadian International Paper Company, of Montreal, provides fuel entirely for the manufacture of paper. The coal-burning steam plant of the Dalhousie mill of the New Brunswick Paper Company uses about 60 per cent. of its annual consumption of 200,000 tons to provide steam for the mill, the balance being used to generate about one third of the mill's power requirements.

The remaining 100,000 tons of the mine's output is divided between two other subsidiary companies; 60,000 tons per year is shipped to the paper mill of the Canadian International Paper Company at La Turque, Quebec, and 40,000 tons to the Bathurst Power & Paper Company at Bathurst, Maine.

The Minto coalfield was first discovered over 300 years ago and its first recorded shipment was made in 1639, when coal from Grand Lake was transported to Boston.

The known resources of the field amount to over 50,000,000 tons, the deposits occurring in disconnected blocks over an area of 150 sq. miles. The coal seams vary in thickness from 12 in. to 24 in. and are found at depths up to a maximum of 120 ft. The mine was first worked by conventional mining, but after 1947, underground mining was abandoned for surface or open-pit mining, following a decline in the manpower resources.

The company purchased large draglines and Gardiner-Denver drilling rigs and a trench was cut down to the old mining level or top of the coal seam. The top surface of the coal seam is cleaned by a small bulldozer, followed by men with shovels and brooms. The dragline, hauling a bucket with a capacity of 13 cu. yd., can excavate to a depth of 80 ft. from each ledge. Trucks drive directly down into the trench and coal is loaded immediately into the vehicles as the excavation proceeds.

The cuts are from 40 to 50 ft. wide and usually extend for more than half a mile in length. As each cut is worked and a new one made, the old cut is filled in by the dragline, leaving a level site as mining progresses.

The overburden largely consists of clay, but frequently strong bands of sandstone, as much as 20 ft. thick, are encountered. These are drilled by either side-wall or vertical drills as the shape of the terrain determines and are blasted in advance of the loading machines.

Dragline in Operation at Miramichi Lumber Company Coal Mine at Minto, New Brunswick.

PHYSICAL PROPERTIES OF COLLIERY STONE DUST

RAPID methods for determining important physical properties of colliery stone dusts used in experimental coal-dust explosions are described in SMRE Research Report No. 197. Compiled by G. Thouzeau and T. W. Taylor, the report, "The Physical Properties of Colliery Stone Dust," is available from the Safety in Mines Research Establishment, Ministry of Power, Portobello Street, Sheffield 1 (price 3s. 3d.).

It is shown that batches of a given dust exhibit significant differences. Further, when stone dust is waterproofed, some of its physical properties undergo a change. An investigation into waterproofed and untreated dusts from three different manufacturers showed certain common trends. The cohesion of the dusts, measured by a modified tilting-plate method, had been reduced on waterproofing by between 27 and 40 per cent.; and specific surface, measured by an air permeability method, had decreased by about 20 per cent.

The investigation also disclosed a good correlation between bulk density and specific surface.

WE MUST HOLD MARKETS WE MUST PAY OUR WAY

THE COAL INDUSTRY TODAY

Five Essentials to Achieve the Double

By E. H. BROWNE, C.B.E.

(Deputy Chairman, National Coal Board)

When he addressed the 1961 annual conference of the National Association of Colliery Managers in Edinburgh, Mr. Browne reminded members that he had addressed their conferences in 1951 and 1954. "We have learnt a lot since then," he said, "but, surprisingly, I found nothing I wanted to unsay and a good deal which, in the light of experience, I would wish today to say more strongly." The industry had problems today no less, though in some ways different, from those of 10 years ago. He said: "We must hold markets: and we must pay our way. For management the test, and the means to do these things, lie in efficiency, reflected in costs."

IT was suggested that as a background to a conference to be devoted to safety I should examine the broad position of the coal industry today, and I have looked for a way to do so through the media of material which you yourselves will have been studying recently.

The board's accounts for 1960 were published a few days ago. A declaration of Government policy has recently been made in the terms of the White Paper on "The Financial and Economic Obligations of the Nationalized Industries," which, though Government action has yet to be taken, is clearly of great significance to us. With these two documents in mind let us try to take stock of the mining industry.

Demand and Supply

There is little need to remind you of the sudden plunge in demand for coal in Great Britain, as abroad, which came in 1958. In two years total consumption fell by 27,000,000 tons per annum to 194,000,000 tons, 4,000,000 tons of which was taken from consumers' own stocks and from the supply "pipeline," leaving in 1959 a total demand on the industry of only 190,000,000 tons. This was a reduction of 31,000,000 tons per annum within the short space of two years (Table 1).

TABLE 1.—*Consumption, Supply, Imports, and Stocks*, 1954-1960 (million tons).

	1954.	1955.	1956.	1957.	1958.	1959.	1960.
Consumption (inc. exports) ..	230	229	227	221	207	194	202
Output	224	222	222	224	216	206	194
Imports	3	11	5	3	1	—	—
Undistributed stocks (end of year)	1	2	3	9	20	36	29

The suddenness of the change brought great difficulties. The board had been criticized previously by authoritative bodies and influential individuals for setting its sights too low. Not long before, the Ridley Committee* had said that the board should expand its plans for future output. The Federation of British Industries had put 1965 demand for coal at just under 300,000,000 tons per annum. Consumers generally over-estimated demand; economic and other experts widely exaggerated it. No one foresaw the setback of 1958/1959. When it came the board adapted its

* "Report of the Committee on National Policy for the Use of Fuel and Power Reserves," Cmd. 8647.

policies to the new situation in ways which are known.

Current production was curtailed without involving any substantial measure of hardship, and stocks were allowed to accumulate according to carefully prepared plans. These policies did not escape criticism. The stocks would never be used. (They have been substantially reduced in 1960 and 1961.) Their value was not equal to that placed on them in the board's books. (As they are lifted it has proved that the writing down which has been made in the accounts was amply sufficient.) The curtailment was insufficient—or too much. (Looking back it seems, to me at least, that it was just about right.) Demand would go on plunging down. (In fact, it increased in 1960.)

These were the criticisms; but the board pursued its policies designed to meet the changed circumstances and continued to do so last year when the purpose was to bring coal production below the level of demand. Consumption recovered to 202,000,000 tons and in the event exceeded output by more than 8,000,000 tons, so that it was possible to absorb some of the stocks accumulated in 1958 and 1959. This was according to plan.

Consumption this year has been a little lower than forecast, no doubt because of unusually high temperatures; nevertheless, unless something quite unexpected happens—as, of course, it can—demand (with exports of 5,000,000 to 6,000,000 tons) will not be far short of 200,000,000 tons. We aim for production of about 190,000,000 tons. The balance, for the present, can be made up from our still large stocks. (They stand at about 23,000,000 tons today.) But we have to look ahead again: we shall not be able to draw on stocks for very long; indeed, well before they run out we shall be in difficulty with certain types, grades, or qualities of coal in certain places unless we now make further adjustments in the pattern of our production.

Manpower

This is not so easy. We have a big industry incapable of quick adaptation and possessing today little short-term flexibility. The labour content of our activities, though reducing, is still high. Only to a limited extent can we adjust production plans to suit the available manpower, and it so happens that the places where we can do so are not in general the places where increased production would be helpful.

Manpower is a cause of concern today in some of the coalfields which have the greatest capacity to assist the financial position of the board.

Productivity

Higher overall productivity is, of course, crucial to our financial position, though I shall emphasize that it can be a misleading index of performance if used by itself for detailed purposes. With some shortages of labour in key places there is an extra edge on the need for higher productivity.

You will remember that the break-through in productivity came in about 1958, when, with the beginning of the rundown of manpower, output per manshift strode away from the 24/25 cwt. level at which it had been more or less static for some time. In 1958 it rose to 25.6 cwt. and in 1959 it increased still more. Again in 1960 a clear advance of 1 cwt. on the previous year was obtained. These gains were attributable to the beginning of fruition of the reconstruction of the collieries, to mechanization at the face, and to the cutting out of some low-productivity production which had been retained to meet total demand.

With these encouraging improvements behind us and with mechanization set for an even higher advance than last year, we hoped to see an average figure of about 29 cwt. per manshift for the year 1961. But in the first months of the year we have not achieved the rate necessary for this. Let us for a moment look inside the overall figures.

In the first quarter of this year productivity at the face was static on both mechanized and conventional faces. There was nevertheless an overall increase of 3 cwt. due to the proportion of mechanized output rising from 36 per cent. in the corresponding period of 1960 to 44 per cent., as is shown in Table 2.

TABLE 2.—*Face Productivity (Cwt. per Manshift).*

	Mechanized faces.	Orthodox faces.	Total.
1st Qtr., 1960 ..	115.9	72.4	78.9
1st Qtr., 1961 ..	115.9	72.5	82.0

Overall productivity, on the other hand, was only 0.5 cwt. per manshift above 1960. This disappointing figure is attributable to a less than proportionate increase in the productivity of those "elsewhere underground" and on the surface and here the figures are disturbing.

In the address which I gave in 1951 I referred to the results postulated in the first National Plan not long before published. An overall productivity of 31.3 cwt. was the figure given for 1965. Of course, the terms of reference have changed since then; the first plan was required to be prepared on an assumed output of 240,000,000 tons, including 30,000,000 tons for export. But it is interesting that the last revision of the plan (1959) puts overall productivity at about the same level—30.31 cwt. per manshift.

In my 1951 address I asked: "how can we falsify the National Plan estimates" which had to be based on current known techniques, and I said that "the answer lies at the face." Many new developments have in fact taken place since 1948/9 and these should make it possible, other things being equal, to increase the overall productivity in the future beyond the figures to which I have referred. But not if the productivity elsewhere in the pits falls below the levels set.

We must not oversimplify the problem. Shortages of manpower, shorter hours, higher overtime, lower output in relation to fixed overhead labour needs, and other factors offset some of the advantages gained by reconstruction on the surface and "elsewhere underground." But the indication is

perfectly clear: we must get these elements of labour down or the gains at the face will be vitiated.

Costs—the Measure of Performance

Now with all the immense importance of productivity as a broad measure of progress in an industry with a high labour content (in which rises in real wages will cost far more than in other industries with a low labour content), we must not allow ourselves to use it as a reliable guide on its own for control purposes.

During the first decade of nationalization when production was unable to catch up with demand and the board was incurring considerable losses by importing coal, productivity provided a pretty rough but not unreliable yardstick. But in more normal circumstances and certainly today it cannot by itself be sufficient and may even be misleading. Of course we need higher productivity; but it is financial results which are the comprehensive guide. The profit, or loss (assuming a stable level of prices), takes into account all the elements which combine to measure efficiency—including quality and size of the product, materials, repairs, power, depreciation, and interest charges.

Work on the coal face must be mechanized: this is an inescapable development which we are urging forward. But the results of individual faces must not be judged on productivity alone. There are heavy depreciation and interest charges as well as other costs to be taken into account and the effect on proceeds must be calculated. There may be too much emphasis on local achievements in productivity and too little on the real financial results obtained. Mechanization for money and markets should be the motto, not for records and reputations. This brings me to the board's financal results.

Colliery Costs and Profits

Between 1957 and 1960 there was a gain in productivity of 12 per cent., yet there was an increase of 3s. per ton in total costs, the net effect of substantial changes which took place in that period. Wages costs fell by 1s. 4d. from 44s. 8d. per ton in 1957 and 43s. 4d. in 1960—not as much as should be expected from the increased productivity, but achieved with falling output and increases in wages. Materials and repairs were reduced by 6d. per ton. On the other hand, other costs, including heavy expenditure involved in putting down and picking up stocks, increased by nearly 3s. per ton and depreciation by nearly 2s. per ton. These increases in costs other than wages have thus more than absorbed the improvements obtained.

And so we have remained "in the red." Not, of course, in terms of operating profits before interest: in 1960 the profits of the collieries themselves were at the rate of 1s. 8d. per ton, and for all our activities the operating profit was £20,000,000; but after paying interest there was a deficit of £21,500,000. In passing, it may be pointed out that, although it would be wrong to make comparisons with past performance of the mining industry without making allowance for changes in value of money and in capital invested, the bare figures (excluding the war period), have been as follow:—PROFIT PER TON: 1927-1939, 5d.; 1947-1959, 1s. 9d.; year 1960, 1s. 8d.

These figures at least indicate that large profits have not been available for coal mining as a whole for a long time. Profits before nationalization were distributed where they arose. A very large part of the industry's capital was then in equity. The yield was not always very high. All the financial problems of the coal-mining industry have not arisen since Vesting Date.

Board's Capital Investment

The financial structure of the board is now completely different, and it may be useful for a moment to look at some important elements of it.

The compensation paid to the previous owners

TABLE 3.—*Summarized Financial Results, Years* 1947 *to* 1960.

Year.	Colliery profits *and losses.*						Other profits *and losses.*				Total profits *(losses).*	Taxation	Interest payable to Minister of Power.	Surplus *or deficiency.*	
	Output. (million tons).	Productivity. (cwt. per manshift)	Proceeds per ton.	Costs per ton.	Profit *or loss.* per ton.	Profit *or loss.* Amount	Opencast.	Ancillaries.	Imported coal *(loss).*	Other items.					Proportion of total income, per cent.
			s. d.	s. d.	s. d.	£m	£m.	£m.	£m.	£m.	£m.	£m.	£m.	£m.	
1947 ..	184·7	21·5	40 3	41 3	*1 0*	*9·2*	—	3·0	*1·7*	*0·3*	*8·2*	—	*15·1*	*23·3*	*6·3*
1948 ..	195·5	22·3	47 3	45 7	1 8	16·2	—	1·3	—	*0·2*	17·3	—	*15·6*	1·7	0·4
1949 ..	200·7	23·4	47 11	45 0	2 11	29·4	—	1·7	—	*4·9*	26·2	*3·5*	*13·2*	9·5	2·0
1950 ..	202·3	24·2	47 10	45 5	2 5	24·2	—	2·3	*0·3*	*0·9*	25·3	*2·5*	*14·5*	8·3	1·7
1951 ..	209·9	24·5	51 2	49 2	2 0	21·2	—	2·8	*5·5*	*3·8*	14·7	*2·0*	*14·5*	*1·8*	*0·3*
1952 ..	212·2	24·2	57 3	56 8	7	5·7	*1·0*	4·0	*1·2*	*1·2*	6·3	—	*14·5*	*8·2*	*1·3*
1953 ..	210·5	24·6	61 1	59 2	1 11	20·3	2·1	1·4	*1·1*	*0·6*	22·1	*5·1*	*16·5*	0·5	0·1
1954 ..	211·8	24·9	63 6	61 11	1 7	16·4	3·1	1·7	*5·0*	*0·6*	15·6	*1·6*	*17·5*	*3·5*	*0·5*
1955 ..	207·8	24·7	69 4	67 4	2 0	21·0	5·5	3·2	*27·7*	*0·6*	1·4	*0·3*	*29·7*	*19·6*	*2·4*
1956 ..	207·2	24·8	78 7	74 5	4 2	43·0	9·5	4·6	*17·4*	*0·6*	39·1	*5·0*	*21·3*	12·8	1·4
1957 ..	207·4	24·9	83 1	81 6	1 7	16·9	9·6	4·7	*11·4*	1·0	20·8	—	*26·1*	*5·3*	*0·6*
1958 ..	201·8	25·6	85 3	83 11	1 4	13·7	8·4	*0·5*	2·5	*0·5*	18·6	10·0	*32·1*	*3·5*	*0·4*
1959 ..	192·5	26·9	83 6	82 5	1 1	10·3	3·9	*0·7*	*0·3*	*0·3*	12·9	—	*36·9*	*24·0*	*2·8*
1960 ..	183·8	27·9	86 1	84 5	1 8	15·6	2·3	2·2	—	*0·2*	19·9	—	*41·2*	*21·3*	*2·6*
Total ..	2,828·1	24·5	64 5	62 8	1 9	244·7	43·4	31·7	*74·1*	*13·7*	232·0	*10·0*	*299·7*	*77·7*	*0·8*

of the industry amounted in total to nearly £400,000,000, but this figure included stocks of products and stores. The fixed assets were valued at £355,000,000, made up of collieries, etc., at £180,000,000, ancillaries (coke ovens, by-product plants, brickworks, houses, estates, etc.) at £95,000,000, and minerals at £80,000,000. These assets have been written down realistically out of depreciation provisions. After allowing for disposals, their book value at December 31, 1960, stood at £150,000,000, of which minerals accounted for £60,000,000.

TABLE 4.—*National Coal Board's Capital (£ million).*

	£m.	£m.	£m.
BOARD'S ASSETS.			
Pre-Vesting Date assets			
Fixed assets:			
Collieries	180		
Ancillaries	95		
Minerals	80		
		355	
Additions to the board's assets since Vesting Date			
Fixed assets:			
Collieries	772		
Coke ovens	49		
Houses	51		
Other fixed assets	91		
		963	
Working capital			
Stocks of products and stores	197		
Less the excess of creditors over debtors	41		
		156	
TOTAL ASSETS			1,474
WRITTEN DOWN BOOK VALUES AT DECEMBER 31, 1960			
(*a*) Pre-Vesting Date assets			150
(*b*) Additions since Vesting Date			650
TOTAL WRITTEN DOWN ASSETS			800
FINANCING OF BOARD'S ASSETS			
Provided out of the board's own resources			
Provision for depreciation and obsolescence	500		
Sales of assets since Vesting Date (wagons £12m.)	25		
Internal funds:	£m.		
Provisions for deferred liabilities	41		
Reserve fund	4		
Unrealized appreciation in value of stocks	9		
	54		
		579	
Deduct: the deficit on profit and loss account		78	
			501
Financed by Minister of Power	£m.		
Compensation for vested assets and stocks paid for by the Minister of Power	388		
Less repayments by the board to December 31, 1960	36		
		352	
Advances made by the Minister to the board since Vesting Date:			
Repayable by 50-year terminable annuities	228		
Repayable by 15 equal annual instalments	224		
Short-term advances	105		
Day-to-day advances	64		
		621	
			973
TOTAL FINANCE			1,474

New capital investment since the Vesting Day spent on reconstructing and maintaining the industry has been £963,000,000, £772,000,000 having been spent on the collieries. Depreciation of over £300,000,000 has been provided on these additional assets. Allowing for sales of assets and depreciation provisions, the written down book value of the assets at the end of 1960 was £650,000,000. So the board's fixed assets as a whole stand at £800,000,000, which, with net current assets of about £160,000,000, brings the total capital invested in the industry to about £960,000,000. It is broadly this figure which represents the board's capital liabilities to the Minister of Power (£973,000,000) and on which interest is paid.

Depreciation

The heavy programme of capital expenditure has been financed partly out of the provision made for depreciation which in the 14 years since Vesting Date amounts to £500,000,000. This is over half the gross capital expenditure since that time. In 1960 depreciation and obsolescence charges were more than £63,000,000, of which the charge to collieries was equivalent to 5s. 6d. per ton.

The basis of depreciation adopted by nationalized industries is of special interest at the present time. The board has hitherto made provision for depreciation calculated on "historic" costs—the original cost of the assets; but it has said repeatedly in annual reports that additional sums towards the increased cost of replacement of assets should be set aside when practicable. The general financial position has not permitted this.

The White Paper on "Financial and Economic Obligations of Nationalized Industries" postulates that provision should be made from revenue to cover depreciation calculated on a replacement cost basis, but says that it is intended to settle a framework (reviewed periodically) for each undertaking in the light of its own circumstances. Important questions will arise for the board when these matters are considered. The actual depreciation rates adopted may need re-examination.

Provision of Finance

As you know, the board is financed wholly by borrowings from the Government. The liabilities for compensation payable for the assets and stocks which were vested initially (about £400,000,000) are repayable with interest at the gilt-edged rate ruling at the various times when compensation was paid. The average rate is about 3½ per cent. and the amount outstanding of the board's capital liability to the Minister was £352,000,000 at December 31, 1960. (This is not the same as the written down value of the assets to which I referred earlier.)

Borrowings subsequent to Vesting Date are governed by the Coal Industry Nationalization Act, 1946, and succeeding Acts, which now limit the balance of advances outstanding to a maximum of £700,000,000 and the net increase borrowed in a fiscal year to £50,000,000. Borrowings up to £750,000,000 or in excess of £50,000,000 in a year may be approved if the Minister so orders and the House of Commons so resolves. Beyond these limits a new Act of Parliament has to be obtained. The net advances outstanding at December 31, 1960, amounted to £621,000,000. The rate of interest paid varies according to the rates ruling at the time the money was borrowed and the way in which it is funded. Part of the advances are repayable over a period of 50 years. Part are medium-term (15 years) loans; some money is

borrowed by the board on short-term (two or three years) mainly for the purpose of financing stocks of coal and coke; and finally, there is a balance owing to the Minister which is always fluctuating from day to day.

The average rate of interest payable on advances to the board since 1947 amounts at present to £4 16s. 8d. per cent. per annum, so that, with the initial "loan" for vested assets the rate which the board pays on its total capital liabilities at the moment works out at £4 6s. 5d., though, of course, the rates paid in recent times have been much higher. The charge for this interest in 1960 was £41,000,000.

Progress Towards Self-financing

The board's borrowings were substantial in recent years because the main burden of capital reconstruction was still being carried and because, simultaneously, heavy stocking was unavoidable. In 1958/59, £91,000,000 was added and £117,000,000 in 1959/60. The board borrowed only £6,000,000 in the fiscal year 1960/61. This fall was due largely to the effect of a substantial stock lift, but apart from this the peak of capital expenditure has now passed. Progress towards self-financing is a live issue for the board. The White Paper says: "There are powerful grounds in the national interest for requiring these undertakings to make a substantial contribution towards the cost of their capital development out of their own earnings, and so reduce their claims upon the nation's savings and the burden on the Exchequer . . ."

As a result of heavy capital expenditure in the coal-mining industry we now have much increased provisions for depreciation which have gradually approached towards the rate of new capital expenditure, which is falling. Looking ahead, therefore, provided nothing unforeseen occurs, there are reasonable prospects of being able to meet our future capital needs without calling upon the Exchequer.

Revenue Account

The Coal Industry Nationalization Act, 1946, lays down that the policy of the board shall be directed to securing (*inter alia*) that "the revenues of the board shall not be less than sufficient for meeting all its outgoings properly chargeable to revenue account . . . on an average of good and bad years." In the past there has been argument about the interpretation of this fairly broad statement. How do we define good and bad years and over what period should the average be taken? As you see from Table 3, the board set off to a bad start with a loss of £23,000,000 in its first year, resulting from the Government's delays in granting assent to increases in prices to cover higher costs. This was followed by ups and downs. If 1947 were to be excluded the board would have broken even to the end of 1956, before the check in demand came. In the intermediate years, the board was unable to earn a margin to recover the 1947 deficit, to allow for "bad" years and to increase financial reserves for reasons I have stated. Views differed as to whether or how far the board should be allowed to increase its prices: coal was scarce and in 1952 half the members of the Ridley Committee wanted to add £1 per ton to the average price of coal. But, as you know, in practice the board was not allowed on various occasions to increase prices to the extent or at the times it desired. That is history; but it accounts for most of the board's accumulated deficit, which was £78,000,000 at the end of 1960.

Although this is an unsatisfactory position, I think we should see it in perspective. You will observe from Table 3 that over the 14 years profits of £245,000,000 have been earned on the collieries and £75,000,000 on ancillaries and open-cast; with some loss on other items there was a net profit (before taxation and interest) of £232,000,000 in this period. A tax liability of £10,000,000 (due to the special basis of computing the board's tax liabilities) and interest payable to the Minister of £300,000,000 has more than absorbed these profits.

The accumulated deficit of £78,000,000 represents 0.8 per cent. of the board's turnover in this period. (It is also only just a little more than the total loss on imported coal—a highly uncommercial operation which it is difficult to conceive private enterprise undertaking.)

The White Paper now proposes the basis on which the financial objectives of nationalized undertakings under their respective statutes are to be interpreted in the future. The unspecified period over which surpluses should be at least sufficient to cover deficits on revenue account is put at five years, and criteria are proposed which are unexceptionable as broad principles regarding depreciation and reserves, although these need to be interpreted carefully in relation to each nationalized industry.

The White Paper goes on to propose the establishment of "financial objectives" for each nationalized industry to be determined "in the light of its own circumstances, needs, and capabilities in relation to the generally prescribed standards. For some the objectives may be expressed in terms of progress towards an appropriate level of self-financing of their capital expenditure concurrently with the provision of suitable provisions to reserve. For others, the objective may be in terms of a specified rate of return on capital employed."

Provision is made for modification of the objective if commercially unprofitable activities are subsequently imposed from outside, or if the Government causes the board to modify its intentions with regard to prices, which will continue to be subject to the kind of control as exists today, including the provision that the board may require a written statement (which may be published) from the Minister if he has exercised control in this field.

I hope and believe that a sensible objective will be settled for the coal industry, having regard to the board's statutory obligations and the element of social service which it is expected to comprehend within its operations. But an objective is in

itself an abstract concept, and whatever its merits it will not by itself help the board to produce revenues "not less than sufficient to cover outgoings," which is its aim—and obligation. It is regrettable that deficits have arisen in recent years. We must not be complacent about our efficiency, but there has been a succession of new burdens to be carried including stocking costs, and the cut back of production. Even since last September when price increases were approved, there has been another substantial advance in wages (in line with other industries); higher National Insurance and Supplementary Injuries Schemes charges have had to be assumed; materials costs have risen; and the provision for obsolescence has been increased.

The Government may require greater provisions for depreciation and reserves than at present adopted. This will depend upon the objective ultimately decided upon, after consultation with the board, by the Minister. However this may be, with the new burdens I have mentioned and with any new ones which may arise, the board's intention will remain to pay its way. We are realists and recognize that in the end interest must be paid on our borrowed capital—capital which carries a fixed rate of interest. It is imperative to earn revenue sufficient, having covered all costs, to provide that interest; and it is patently wrong to allow a deficit to build up, however unpalatable the steps necessary to prevent this may be.

Production Plans and Pricing Policies

Now the best way to make a surplus is by reducing costs. We must strengthen our efficiency and improve costs. Since this is a management conference I might well leave the matter there. But just what do we mean by ensuring that revenues cover outgoings? Do we mean for the industry as a whole or do we mean pit by pit? Or what?

For reasons well known to you, it is not realistic to expect to do so for each separate colliery, though this is a broad ideal. At the other extreme we certainly cannot be satisfied to take the results for the industry as a whole because what happens within it is all important. Can we make revenues cover outgoings for each Area? Or at least for each coalfield? The latter I think is an aim which will lead to the right production planning and the proper allocation of output between coalfields under our National Plan. It will not at all times in all places be capable of being attained. But it is a broad objective towards which the board is constantly striving.

In the circumstances of the day—in the competitive world of fuel in which we live—we can afford less than ever to carry low productivity, uneconomic tonnage—tonnage which will become more uneconomic as real wages rise. We must make the fullest use of our valuable assets—our profitable capacity. We must make the fullest use of our higher capitalized and reconstructed pits. And we must be able to obtain a closer relativity between prices and costs.

These things are necessary because we mean "to pay our way." But we are living in a free society in which the consumer is going to have freedom of choice of the fuel he uses, and in a time when competition from oil will be increasingly vigorous. How can we be commercially viable in this situation?

Marketing

Let us have a look at our future markets. In 1960 the loss to oil was substantial and we know of further cases where conversions are being made or at least contemplated which might involve further heavy losses. There is no doubt that the challenge in both industrial and domestic fields by oil will continue. But there is no need to be downhearted. We shall hold a lot of industrial business; and although more domestic heating will be provided by coal through wire or pipe, the level of demand for solid fuel has been sustained year after year at a higher level than the experts have forecast. It is in fact sizable—30,000,000 tons per annum of coal apart from coke; with the new appliances available and with new development now actively pursued, it will go on being sizable—an important market not only for this reason but because the image of the board in the mind of the public is seen in domestic supplies.

There are, however, three markets of pre-eminent importance. A very large amount indeed of energy is going to be used to generate electricity. Throughout the world coal is producing and is expected to produce the majority of electric power for which there is an ever-increasing demand. Not that we should regard or treat this as a captive market: electricity as our largest single customer today already deserves the greatest consideration and the best of service; and it must not be expected in the future to carry burdens for other consumers. But if on our side we are efficient, there is a potential market of 100,000,000 tons per annum of coal for this purpose alone.

The market for gas coal has its problems; but with the development of the Lurgi process we believe demand can be held, and furnished by coal.

The reduction of iron ore is the third pre-eminent market. Increased efficiency in blast-furnace techniques is reducing the ratio of coke used to steel produced, but the total tonnage of coking coal will remain large. Moreover, we are confident that the injection of milled coal into blast furnaces will show advantages over oil. The steel industry is a valued customer, to meet whose stated requirements we have made considerable capital outlays.

It is known that in one form or another the demand for energy will go on rising. We can hold the share in this for coal.

Conclusion

The industry has problems today no less, though in some ways different, from those of 10 years ago. We must hold markets: and we must pay our way. For management the test, and the means to do these things, lie in efficiency, reflected in costs.

Here are five essentials to achieve the double objective:—

(1) With the techniques established in the last decade, aided by new improvements, we must raise face productivity beyond the levels assumed before those techniques were available, choosing the most favourable methods in terms of overall cost—and profit.

(2) We must hold down labour costs elsewhere underground and on the surface.

(3) We must make maximum use of our profitable capacity, especially that of reconstructed pits, and carry on with the careful evolution of our plans to cut our uneconomic capacity.

(4) We must hold our markets by holding prices at levels competitive with oil and by giving the customer the fuel which he wants, which is what it purports to be, and which is consistent in quality with specification.

(5) We must mobilize all the latent capacity of human beings in the industry to spur themselves to keep pace with the conditions of the day.

I have spent virtually all my life in coal. I know the people in it. I rely confidently on the resourcefulness of those whose job it is to run the industry; on their high sense of responsibility; on the professional standards of our engineers and on the integrity of management of the collieries; and the determination of all of us to make coal mining a secure and successful undertaking.

SOUTH STAFFS BRANCH, NACM, ANNUAL MEETING

AT the annual meeting of the South Staffordshire, Warwickshire, Worcestershire, and Shropshire Branch of the National Association of Colliery Managers, held at Sutton Coldfield on May 25, Mr. J. A. Every, manager of Birch Coppice Colliery (Warwickshire), was elected president in succession to Mr. T. L. Carr. Other officers re-elected were:—Vice-president, Mr. W. H. Crosland; secretary, Mr. R. J. Hasbury; treasurer, Mr. J. H. Wilkinson; council members, Mr. Wilkinson, Mr. Crosland, Mr. J. W. Evans, Mr. R. E. Ward, Mr. G. A. Schofield, Mr. T. S. Smales, Mr. H. D. Gilham, and Mr. A. Darlow.

The president and the immediate past-president were elected to serve on the association's National Council, with Mr. W. A. Machin as substitute. Mr. S. Pitchford will serve as representative on the divisional consultative council of the West Midlands Divisional Coal Board. Representatives on the Area consultative council will be Mr. Pitchford (Warwickshire), Mr. Crosland (South Staffordshire), and Mr. T. Kitchin (Cannock Chase).

In his annual report the branch secretary (Mr. Hasbury) said the branch had 134 members in this country and five residing abroad, with 21 associate members, making a total of 160.

Floodlighting at Marshalling Yards

MARSHALLING yards at the South of Scotland Electricity Board's new Kincardine generatting station have been installed to handle 375 wagons of coal a day, or nearly 2,250,000 tons of coal a year, and AEI M25 floodlights have been mounted on 60-ft. Tubewright towers to provide adequate illumination for round-the-clock handling of the bulk fuel.

HIGH TOWER FLOODLIGHTING OF MARSHALLING YARDS AT KINCARDINE GENERATING STATION.

The grouping of the 76 specular and diffuser reflector floodlights holding Mazda 1,000-W GLS lamps on the eight towers has been done to provide good all-over illumination through the whole area with extra light over the line points.

FORTHCOMING EVENTS

JULY 3

Southern Counties Institute of Mining Engineers:—Visit to the Ford Motor Company, Limited, Dagenham (Essex).

JULY 17 and 18

Institution of Mining Engineers:—Junior section meeting in Nottingham.

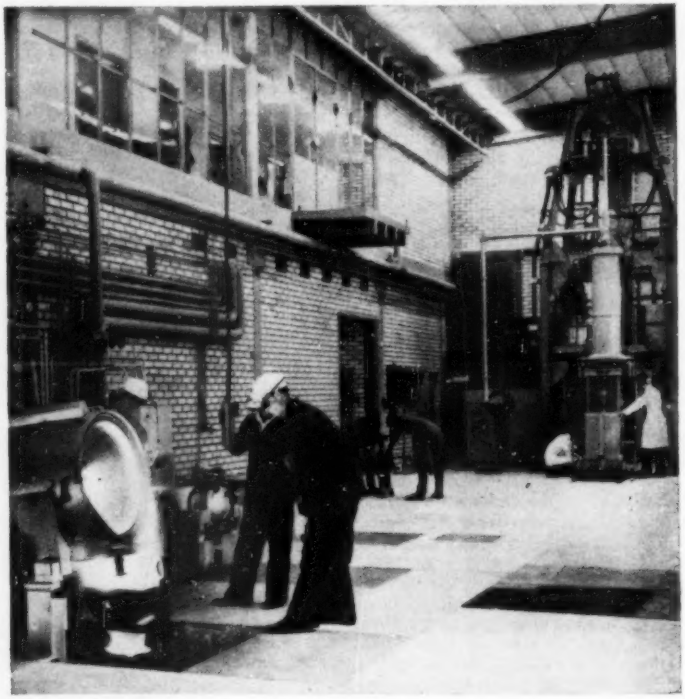
JULY 19-21

Institution of Mining Engineers:—Summer meeting in Nottingham.

National Association of Colliery Managers

JULY 5

North of England Branch:—Meeting at the Mining Institute, Neville Hall, Newcastle-upon-Tyne, at 6.45 p.m. Presidential address on "Safety in Mines," by J. T. Robson.



For the process metallurgists the most important pieces of equipment are the melting furnaces. In the process metallurgy department seen here an induction furnace is being tapped. In the background is a new high-vacuum consumable electrode arc furnace.

SANDVIK'S NEW RESEARCH LABORATORIES

NEW steel research centre and laboratories of Sandvikens Jernverks AB (Sandvik Steel Works Company, Limited), formally inaugurated by the King of Sweden, have cost about £500,000. The company's steel research organization employs more than 250 people and is the biggest in Sweden. In 1960 the company's expenditure on research was equal to 3.5 per cent. of its turnover in that year.

Research on physical metallurgy is carried out in a new five-storey main building with a total floor area of about 35,000 sq. ft., which contains a powerful electron microscope capable of a magnification of 200,000, an X-ray machine, a high-temperature microscope, etc.

The new pilot plant for research into process metallurgy contains heavy equipment such as a high-vacuum consumable electrode furnace, high-frequency melting furnaces, pelletizing and reduction equipment, and laboratories for basic research into steel production methods and the reduction of ore.

For research into steel production and development of special steels there are two laboratories, one for tubes and bars and the other for strip and wire.

Among the important fields of research at the new laboratories is the development of new steels for nuclear reactors. For the first Swedish power-producing reactor, the R3/Adam, of about 70 MW, now under construction near Stockholm, Sandvik is supplying more than 20,000 m. of high-grade stainless tubes for use in the heat exchangers. The material selected is an austenitic steel with a maximum carbon content of 0.03 per cent., a nitrogen content of 0.05 per cent., and a low carbon content. In order to prevent confusion of materials during the manufacturing process, the steel charges are marked with a radioactive isotope. Every finished tube is inspected ultrasonically.

Besides the specialities already mentioned, Sandvik has developed a number of others in the field of stainless steel. These includes core wire for welding electrodes, stainless spring wire, stainless spring steel in strips, sulphur-alloyed free-cutting steels, and steels for honeycomb structures in airframes, etc.

CATHODIC PROTECTION

ARISING out of the work of the committee which is engaged in the preparation of a British Standard code of practice to cover various methods of protecting steel structures which are subject to corrosion in air, water, or oil, it has been agreed that work should begin on an electrical code of practice concerned with the particular method of guarding against corrosion known as cathodic protection, the Institution of Electrical Engineers announces.

DAVID MUSHET——————WILLIAM KELLY

Two Contemporaries of Bessemer

by M. SCHOFIELD, M.A., B.Sc., F.R.I.C.

THE 150th anniversary of David Mushet's birth on April 8 brings to mind the way in which both Mushet and William Kelly—also born 150 years ago—had some claim to the success attained by the Bessemer process. While the value of Mushet's work and his spiegeleisen have been acclaimed in textbooks on the iron and steel industry, little or no space is given in reviewing the rival claim of the Kentucky ironmaster Kelly. One view to be avoided is the extreme to which J. W. Boucher went in his biography of Kelly, a study in which one reads of "the so-called Bessemer process," of "two Englishmen who worked for Kelly" absconding after gaining insight into his air-blowing operation, and returning to England via Pittsburgh.

William Kelly was the son of an Irishman who emigrated to Pittsburgh 160 years ago, Kelly junior being born on August 21, 1811. Kelly bought an ironworks belonging to R. L. Cobb at Eddyville, where an abundance of iron ore in the neighbourhood was the deciding factor. Kentucky was at that time noted for a cold-blast charcoal pig-iron; yet, as in Britain, there was the problem of limited charcoal supplies due to heavy cutting of timber in the region. Kelly had a further problem in that the local ore was difficult to smelt because of the black infusible "shadrac" in it.

Sugar-boiling Kettles

He began experiments in 1847 and appreciated early that a strong blast might well be essential to burn out carbon and impurities. At the Cobb site in Eddyville he ran his furnace and forge to produce sugar-boiling kettles, which were in considerable demand, just as Abraham Darby began with his iron pots. Since his difficulty was first in melting, he built a furnace "with a circular cylinder inside." At the base was a circular fireclay tile perforated to act as a tuyere, with an air chamber and a pipe leading from a blowing-engine. Yet the varying quality of the ore was a problem, since no chemical analysis was available in his day. Kelly then tried another "converter" holding 15 cwt. of iron, and went on to build five or six of these, using cold blast in face of the prevailing idea that this would chill the molten iron; he tended to work secretly to avoid ridicule from ironmasters who held this view on cold blast.

Later he set up a secret furnace away from his ironworks, especially when his creditors became impatient with his "air-boiling process" and demanded that Kelly should stick to the normal iron-smelting technique then practised. With his brother John as assistant he carried on with borrowed capital from his father-in-law.

At some point in his experimenting Kelly noted how an air blast in his "finery fire" maintained the charge white-hot, this being because there was sufficient carbon in the iron to provide the heat from oxidation. In American dictionaries of biography it is told how Kelly became so excited on discovering this point that a doctor had to be sent for, since Kelly's wife believed him affected mentally. In Boucher's account the doctor called in by Kelly's father-in-law foresaw the value of Kelly's idea of oxidizing carbon even with cold air. The technique adopted by Kelly involved what was a small blast-furnace rather than a "converter," the furnace having two tuyeres, a higher one for melting and the lower one for introducing the cold blast for blowing the charge. Kelly claimed that his blooms were held in high repute and were later used almost entirely for making boiler plates fitted in the many steam boats on the Ohio and the Mississippi.

In 1857, despite Bessemer's patent granted in America, Kelly was given a patent and declared the original inventer of the air-blowing process. This move did not bring him reward for his efforts, yet it held back any application of Bessemer's process in America, Kelly's patent being renewed while Bessemer was refused renewal of his. Later came full recognition of the Bessemer converter which alone could work large amounts of metal, Kelly's process producing refined iron of good quality rather than steel as Bessemer did, "with the aid of Mr. Mushet" as biographers put it.

Meanwhile, the Eddyville ironmaster was in poor financial circumstances, the financial panic which

hit America in 1857 putting an end to his idea of building a steel plant with a large output. Kelly sold his patent to his father for $1,000, but when the father died in December, 1860, the patent passed to Kelly's sisters. Yet a century ago he began again when a Pennsylvania ironmaster named Morrell gave him part of his yard at the Cambria ironworks and an assistant to help him to experiment further. Kelly built a new converter, this time a tilting one; yet he used too strong a blast and again failed to win more than some ridicule or references to "Kelly's fireworks." He did improve his tilting converter, however, and returned to Louisville to found an axe-making business after standardizing his process producing "refined plate metal by blowing it for about 15 to 25 minutes." His supporters maintained that only he and not Bessemer knew when to stop the blast and leave in the metal a small proportion of carbon to yield good steel.

Kelly died on February 11, 1888, with the Kelly pneumatic process tried by Detroit and New Bedford ironmasters until the Bessemer process became substantiated. He won little or no perpetuation despite Boucher's far fetched plea: "Let his accomplishments impel the sculpturing hand of the future to erase the name of Henry Bessemer from the cold and lifeless marble of the past, and carve in its stead the name of William Kelly."

An Eminent Father

Turning now to Robert Mushet of the Forest Steelworks, here was a further example of an inventor who made little wealth from his genius in contrast to Bessemer, who, in his own words, received in royalties "1,057,748 of the beautiful little gold medals issued by her Majesty's Mint."

Mushet was born at Coleford in the Forest of Dean and assisted his eminent father in metallurgical work. (Mushet's father became noted for his work at the Clyde ironworks and then at the Calder works, and for discovering Blackband ironstone. His brother, or uncle to Mushet *fils*, was employed at the Royal Mint.)

In 1848 young Mushet had become closely interested in the virtues of manganese in steelmaking and in spiegeleisen, which was made in Rhenish Prussia from a manganiferous iron ore. Hence came the experiments in which such additions to "burnt iron," or metal left after air-blowing had removed all carbon, proved the answer to Bessemer's "over-burnt" steel.

A sample of Bessemer's steel or "Bessemerized haematite cast iron" from the Ebbw Vale Company fell into his hands, a metal he compared with over-burnt wrought iron; hence came Mushet's addition of spiegeleisen for turning it to a cast steel; his three patents of 1856 for the air-blowing process to improve iron; and then two further patents in September of that year, though not specifying the use of a converter. Mushet admitted that he by no means maintained that if he had never introduced the spiegeleisen method no one else would have discovered it. Yet he received small reward from Bessemer in an annuity of £300, and only the Bessemer Medal as recognition from international societies.

Robert Mushet on his anniversary should be commemorated not only for his role in the working of the Bessemer process, but for his experimenting with titanium and tungsten in steelmaking and his many patents. He was a vigorous character at times, bursting into sardonic attacks on critics who remarked on his many patents.

While in 1856 he took out five patents in one month, a further period in 1859-61 saw him granted a score of patents for improving steel by additions of chromium, titanium, and other alloying elements. Thus Dr. Percy led one attack by referring to 13 patents for the application of titanium in one form or other as "a remarkable incident even in the annals of patentism." But worse to Mushet's faith in steel rails were criticisms arising when a rail collision caused one rail to be fractured and one or two to be splintered. In Engineering on December 27, 1867, Mushet wrote with venom against an Anti-steel League seeking to claim compensation due to splinters from the over-burning of the steel used. "Let those crusading for iron rails desist unless in jest. Perhaps they would like to go back to wooden rails and wooden wheels. We might have engineers with wooden heads, but dry rot affecting rails, wheels, and brains would be the drawback."

Like his contemporary, Kelly, the Coleford man was self-contained, preferring to work on his own. It was his boast that: "I was never inside any steelworks but my own." He never saw the outside of one except the Avonside works, never visiting any Sheffield works, where later his two sons were to become managers. Mushet died at Chelmsford 60 years ago.

TECHNICAL DATA ON CONSTRUCTIONAL ALLOY STEELS

PUBLISHERS of a new book on "Alloy Steels," Samuel Fox & Company, Limited, Stocksbridge, near Sheffield, emphasize that it is not a catalogue of Fox products, but a collection of technical data on a selection of constructional alloy steels set out in a variety of ways so as to be of maximum use to metallurgists.

In addition to data showing the effects of alloy composition, of mass and of heat treatment on the mechanical properties of steel, it includes information on the newer concepts of hardenability, isothermal, and continuous cooling transformation.

"Alloy Steels" is probably the most comprehensive collection of technical data ever published on British Standard alloy steels. Copies are available from the company at £2 2s. each.

AWARD OF A CONTRACT for controlling a fire that has burned nearly 25 years in a coal deposit on public land near Paonia, Delta County, Colorado, is announced by the Bureau of Mines, US Department of the Interior. The Delta County fire first was sighted in 1937 by J. B. Dewell, a nearby rancher, and since has burned more than 300 ft. along an outcrop and covers an area of approximately an acre.

New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Mining and Mining Appliances

861,136. H. ARNOLD. Mining hoists.
860,996 GUTEHOFFNUNGSHUTTE STERKRADE, A.G. Mine shaft linings.
861,046 R. BOSCH, G.m.b.H. Hydraulic pitprops.
861,000 MINING ENGINEERING COMPANY, LIMITED. Self-troughing belt conveyors.
861,314 ANDERSON, BOYES & COMPANY, LIMITED. Mineral-mining machines.
860,900 GEWERKSCHAFT EISENHUTTE WESTFALIA. Conveyor on which a coal-winning device is releasably fixed.
861,685 BAYLISS, JONES & BAYLISS, LIMITED. Roof or wall supporting devices for mines.
861,489 AUSTIN HOY & COMPANY, LIMITED. Tool-holding devices for coal-getting chains.
862,210 K. BALTHASAR. Mine roof supports.
862,119 SKIP COMPAGNIE, G.m.b.H. Apparatus for use at the charging or discharging station of a mine shaft winding installation.
862,033 MASTABAR MINING EQUIPMENT COMPANY, LIMITED, and others. Extensible hydraulic supports.
862,393 GEWERKSCHAFT EISENHUTTE WESTFALIA. Roof support with goaf screen in mines.
862,298 MAVOR & COULSON, LIMITED. Cutter chains for mining machines.
862,514 SOC. DES FORGES ET ATELIERS DU CREUSOT. Automatic control means for electrically driven mine hoisting machinery.
862,521 UNION CARPIDE CORPORATION. Mining apparatus.
862,252 MINE SAFETY APPLIANCES COMPANY. Protective helmet with removable suspension.
862,921 F. SCHMID. Mine roof support frame.
862,983 GEWERKSCHAFT EISENHUTTE WESTFALIA. Two-piece device for connecting scraper flights to the endless chains of double-chain scraper conveyors.
862,889 H. HEMSCHEIDT. Wedge connection between pitprop and roof bar.
862,773 QUALTER, HALL & COMPANY (SALES), LIMITED. Measuring pockets for coal skips.
862,935 ELECTRIC HOSE & RUBBER COMPANY, LIMITED, and another. Infusion seals for use in mining operations.
862,783 P., L., AND A. VANWERSCH. Mine roof support bars.
863,262-3 ENGLISH ELECTRIC COMPANY, LIMITED. Electric control systems for winders and hoists.
863,455 CRAWLEY INDUSTRIAL PRODUCTS, LIMITED. Coal-cutting machines.
863,283 CRAWLEY INDUSTRIAL PRODUCTS, LIMITED. Coal-cutting machines.
863,298 CHARBONNAGES DE FRANCE. Intrinsic safety igniting devices for electronic flash units.
863,251 GEWERKSCHAFT EISENHUTTE WESTFALIA. Ram device or coal plough or scraper box which is pulled along the coal face by a draw chain.

Metallurgy and Engineering

861,192 UNITED STEEL COMPANIES, LIMITED. Alloy steels.
861,132 H. TOR-ISTEG STEEL CORPORATION, S.A. Reinforcement rods for concrete.
861,047 INSTITUT DE RECHERCHES DE LA SIDERURGIE. Method of improving the blow in Thomas converters.
861,180 ARMCO INTERNATIONAL CORPORATION. Heat-treatment of austenitic stainless steels.
860,988 KLOCKNER-WERKE, A.G. Synthetic production of pig-irons.
861,238 ARBED, ACIERIES REUNIES DE BURBACH-EICH-DUDELANGE, S.A. Steelmaking process.
861,147 SVENSKA KULLGERFABRIKEN, S.A. Nozzle sleeves for the slow casting of steel, more particularly in vacuum.
860,936 KOPPERS COMPANY, INC. Blast-furnace system.
861,276 ALLMANNA SVENKA ELEKTRISKA, A.B. Electric vacuum melting furnace.
861,565 STRACHAN & HENSHAW, LIMITED. Wagon handling assemblies.
861,603 SALLE STEEL COMPANY. Metallurgical progress for treating steel.
861,383 INSTITUT DE RECHERCHES DE LA SIDERURGIE. Desulphurizing molten metal—in particular, liquid pig-iron.
861,384 TITAN COMPANY, A.S. Desulphurizing metallic iron.
861,745 WEAN EQUIPMENT CORPORATION. Shearing continuously advancing strip.
862,057 STRACHAN & HENSHAW, LIMITED. Wagon handling devices.
861,813 IMPERIAL CHEMICAL INDUSTRIES, LIMITED, and another. Manganese base alloys.
862,169 UNION DES VERRERIES MECANIQUES BELGES, S.A. Charing shaft furnaces.
861,892 ANADITE, INC. Vacuum metalizing high-tensile steel parts.
862,421 ROCHLING'SCHE EISEN-UND STAHLWERKE, G.m.b.H. Case-hardening steels.
862,743 BRITISH IRON AND STEEL RESEARCH ASSOCIATION. Pressure applying or responsive means.
863,001 ENTERPRISE R. ET J. MORITZ. Intensifying the roasting of ores in hearth furnaces by recycling the combustion gases.
862,979 ELEKRRO-MOTOREN, A.G. Producing from strip metal ring-shaped bodies having radial slots.
863,160 DOITTAU PRODUITS METALLURGIE. Feed heads for ingot moulds.
862,968 DEMAG, A.G. Plant for reeling rolled strip in continuous strip mills.
863,167 BOCHUMER VEREIN FUR GUSSTAHLFABRIKATION, A.G. Vacuum degasification of steel.
863,018 INSTITUT DE RECHERCHES DE LA SIDERURGIE. Continuous pre-refining of molten pig-iron.
863,074 UNITED STATES STEEL CORPORATION. Troughed belt conveyor.
862,928 PHOENIX-RHEINROHR AKTIENGESELLSCHAFT VEREINIGTE HÜTTEN-UND RÖHRENWERKE. Cladding of metal.
863,038 FOUNDRY SERVICES INTERNATIONAL, LIMITED. Exothermic mixtures for use in the production of castings and ingots.
862,777 UCPMI. UNION DE CONSOMMATEURS DE PRODUITS METALLURGIQUES ET INDUSTRIELS. Stirring steels during their solidification.
862,791 UNITED STATES STEEL CORPORATION. Ceramic coated tuyeres and method of making them.
862,764 DEMAG - HUMBOLDT - NIEDERSCHATOFEN, G.m.b.H. Production of smeltable briquettes from iron ore.
863,250 BOHLER & COMPANY, A.G., GEB. Process of

feeding the molten metal when pouring billets of elongated sections.

863,675 R. SHIELDS. Treating molten metals.

863,234 STAHL-UND WALZWERKE RASSELSTEIN/ANDERNACH A.G. Electrochemical treatment of tinplate.

863,331 COMPAGNIE DES METAUX D'OVERPELT-LOMMEL ET DE CORPHALIE. Treatment of ores.

863,461 BOCHUMER VEREIN FÜR GUSSSTAHLFABRIKATION, A.G. Electrical resistance heating of steel ingots.

863,583 ROCHLING'SCHE EISEN- UND STAHLWERKE, G.m.b.H. Calcination of limestone.

863,645 BEISNER, K. Method and tool for perforating ingots.

Fuel Treatment and Utilization

861,537 CONSOLIDATION COAL COMPANY. Conveying a slurry through a pipeline.

861,937 W. SIMON. Preparation of wet fuels.

862,287 SIMON-CARVES, LIMITED. Coke-oven batteries.

863,212 L. & C. STEINMULLER, G.m.b.H. Simultaneous production of coal gas and steam from coal.

863,354 SIEMENS-SCHUCKERTWERKE, A.G. Installations for crushing and drying coal supplied to pulverized-coal burning furnaces.

Lord Mills to Open New Welding Research Laboratory

NEW 21,000-sq. ft. engineering laboratory at the British Welding Research Association's Abington research station is to be formally opened by Lord Mills, the Paymaster General, on July 12, during the first day of a two-day exhibition of research in progress being staged for industrialists and engineers concerned with the development and application of welding. The two-storey building will house pressure vessel, brittle fracture, and resistance welding researches, in addition to an extensive machine shop, while the upper floor will provide office accommodation and conference rooms.

Since the association acquired Abington Hall, Cambridge, in 1946, the researches now being transferred have been carried out in the former stables and in ex-army huts. In spite of the difficulties of working under these conditions, the association has been able to sustain a heavy programme of research and to deal with an infinite variety of industrial problems, ranging from the study of brittle fracture in heavy steel plate to the welding of catch plates into cooked meat cans. There is now need, however, to initiate several new and important lines of research and to extend considerably the range of available scientific and commercial equipment. In addition to providing proper facilities for the researches specified, the use of the new building will relieve the congestion in the other laboratories and thus enable metallurgical researches to be expanded.

A NEW COMPANY, Forja de Colombia, has been formed in Bucaramanga, Colombia, with an initial capital of 10,000,000 pesos for the production of spare parts for bulldozers and eventually for all types of vehicles and engines. The plant will use some 15,000 tons of steel a year from the Paz del Rio plant. The Federación Nacional de Cafeteros is to grant the company a $US7,000,000 loan to finance purchases of forging equipment from western Germany.

Nigeria's Potential for Steel Industry

TWO special reports on the potential for establishing an iron and steel industry in Nigeria —and on possible West African markets for such an industry—are now available. The reports, commissioned by the Federal Government of Nigeria, are the results of surveys carried out by the West African and marketing development companies of the Production-Engineering, Limited, group and their associates, Campbell, Gifford & Morton, Limited.

The first report is in the form of a compendium listing all necessary information on local sources of ore, coal, limestone, and other raw materials and energy for projected operations, while the second report provides a detailed evaluation of West African markets for all types of iron and steel products.

Also included is a survey of availability and types of ferrous scrap in Nigeria. Both reports are contained in a single volume.

The Governments of the Federation of Nigeria hope to see a large-scale iron and steel industry established as soon as possible in view of the ample resources of the country and the expanding market.

The Governments also hope that private enterprise will provide not only management and technical "know-how," but will also be prepared to invest in the project. Companies interested in this industry are invited to submit detailed proposals to the Federal Ministry of Commerce and Industry, Lagos, not later than December next.

Copies of the reports mentioned above are available from the Commercial Counsellor, Nigeria House, 9, Northumberland Avenue, London, W.C.2, and Production-Engineering, Limited, 12, Grosvenor Place, London, S.W.1.

PORT KEMBLA'S 550-TON OPEN-HEARTH FURNACE

THE bringing into production of a new 550-ton basic open-hearth furnace at the Port Kembla Steelworks on November 23, 1960, according to an article in the BHP Review (February, 1961), means that Australia will now have available an additional 350,000 ingot tons of steel per annum. The new furnace will give employment to approximately 130 men.

It will raise Port Kembla's annual steel ingot output to over 2,600,000 tons, making the works the second-largest steel producing centre in the British Commonwealth.

No. 2 open-hearth shop, where the new furnace is located, now comprises four furnaces, Nos. 31 and 32, each of 300 ingot tons nominal capacity, and No. 33 of 450 tons; these, together with No. 34 furnace rated at 550 tons, brings the total annual ingot-making capacity of the shop to over 1,200,000 tons. The 550-ton furnace has been equipped to allow the direct blowing of oxygen.

PAPERS SET AT

Colliery Managers' Examinations

TEXT has been published of the papers set at the examinations held under the Mines and Quarries Act, 1954, by the Mining Qualifications Board on May 16, 17, and 18. The questions for the first-class colliery manager's certificate are given below. Five questions only were to be answered for each paper and the maximum number of marks given for each question was 20.

The time allowed for each paper was 3 hr., with the exception of that on mining legislation, for which 2½ hr. was allowed.

Winning and Working

(1) A daily output of 2,000 tons is to be produced by power loaders from a seam 3 ft. in thickness lying at a depth of 1,000 yd. Roof and floor conditions are moderately good and the inclination averages 1 in 20.

Sketch and describe a suitable layout of roadways and faces, showing all principal dimensions and explaining in detail how the seam would be developed up to the final output. Indicate the system of transport of coal and materials and explain what arrangements may be made to cater for periods of peak output.

(2) Describe, with the aid of sketches, drilling equipment, arrangements and the operation of putting down a borehole from the surface to a depth of 3,000 ft. through coal-measure strata. There is ample information of the measures down to a depth of 1,000 ft.

(3) Describe, with sketches, the operation of sinking a vertical staple shaft 13 ft. inside diameter between two horizons 100 yd. apart. Include details of the method of lining employed.

(4) Explain the likely causes of excessive cost in the back ripping of gate roads, and describe the steps which can be taken to obtain an improvement.

(5) With the aid of sketches, describe the construction and method of operation of one type of powered support suitable for use on a longwall power-loaded face. Enumerate the advantages and limitations of powered supports.

(6) In what circumstances might each of the following methods of waste support be adopted:—(*a*) strip packing, (*b*) solid stowing, and (*c*) total caving.

Describe one system of power stowing of dirt, giving details of personnel and performance.

(7) A level cross-measures tunnel is to be driven a distance of 1,500 yd. and lined with 16-ft. by 12-ft. arches. Describe how the work would be organized so as to obtain the maximum rate of drivage. Give details of the method of drilling, loading the dirt and the haulage arrangements.

(8) Name the alternatives to the use of explosives on the coal face and enumerate their disadvantages and limitations when compared with orthodox shot-firing. Describe in detail the method of use of one of the alternatives and list the equipment required.

Theory and Practice of Ventilation

(1) The surface fan at a mine exhausts 170,000 cu. ft. of air per minute at a water gauge of 6 in. and the overall efficiency of the plant is 50 per cent.

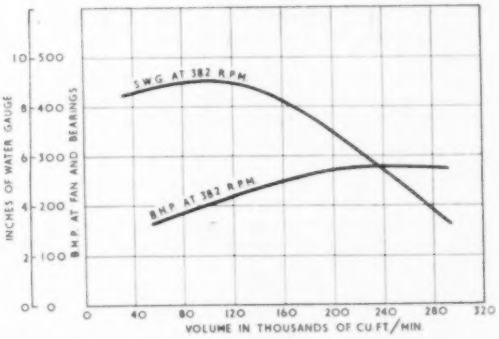


FIG. 1.

A new fan, the characteristics of which are indicated on the graph (Fig. 1), is in the process of being installed to replace the unit. Find the amount of air that will flow in the system and the saving in power that will be made by the use of the new fan if the efficiency of its motor and drive is estimated at 93 per cent.

(2) Explain the problems which are associated with the ventilation of longwall faces in thin seams which have a high rate of gas emission with particular reference to the occurrence and prevention of gas layering in roadways.

(3) Figures shown in Table I refer to the results of a pressure/quantity survey made of the main roads within a main split of a mine ventilation system. The workings are level and the main intake

and main return are 40 yd. apart. Calculate from this data:—(*a*) the resistances of the individual sections of the main intake and main return airway, (*b*) the resistance of the leakage splits, and (*c*) the resistance of the workings inbye C—D.

TABLE 1.

Station.	Section.	Pressure drop in. w.g.	Total pressure drop in. w.g.	Distance yd.	Quantity flowing cu. ft./min.	Remarks.
A			0.00	0.00		At downcast shaft. Start of survey.
	A—B	1.85		830.00	60,000	Through main intake airway.
B			1.85			Junction of connecting road.
	B—X	4.83			6,000	Through doors in connecting road to return airway.
X			6.68			Return side of doors.
	B—C	1.52		652.00	54,000	On main intake inbye of B.
C			3.37			In main intake at splitting point.
	C—D	1.00			3,000	Water gauge at splitting point.
D			4.37			In main return at junction of split returns.
	D—X	2.31		660.00		In main return.
X			6.68			In main return.
	X—E	1.28		828.00	60,000	In main return.
E			7.96			At upcast shaft.

(4) State the disadvantages in (*a*) ventilating a double-unit face by using two adjacent intakes, (*b*) ventilating two double-unit faces which are in a continuous line by using the centre gate of each double unit as an intake.

(5) Explain the purpose of ventilation planning. Describe the plans associated with this work and the detail to be shown on such plans.

(6) The ventilation system at a mine consists of two unequal main splits, one being heavily regulated. It is required to increase the flow of air in the longer split by 30 per cent. What are the comparative advantages in obtaining the increase in flow by (*a*) increasing the speed of the surface fan, and (*b*) installing a booster fan within the split?

(7) Describe a method of determining the rate of firedamp emission from a single-unit fully mechanized longwall face. List the instruments you propose to use in the work.

(8) Describe in detail, the whirling hygrometer. State the purpose for which it is used, and the information which can be obtained from its use. Illustrate your answer.

Explosions, Underground Fires, and Inundations

(1) What provisions may be made in the planned layout of mineworkings to facilitate the choice of position and erection of stoppings in the event of a district having to be sealed off after a fire or explosion?

Illustrate with a sketch the general principle of construction of an efficient seal, and show how you would provide for stability against explosion.

(2) Describe a method for determining the percentage inert matter in a mine roadway dust sample likely to contain carbonates. Indicate how a representative sample of the dust deposited on a roadway surface may be obtained.

(3) What is implied by the term "relative inflammability" as applied to coal dusts and how can it be assessed? Describe a method employed in coal mines to reduce the inflammability of dust deposited on roadways.

(4) Write an account of the effects of environmental conditions on personnel at the scene of a mine fire.

(5) You have received an urgent message informing you that flames appeared from a break in the upper sandstone roof at a roadhead immediately after the firing of ripping shots, but as a result of the prompt action of those on the spot the fire has apparently been quickly extinguished. On arrival at the scene how would you, as manager, proceed to satisfy yourself that all danger had passed? If you were in any doubt what further action would you consider it necessary to take?

(6) What general principles would you apply to the repair and sealing-off of very large roof cavities on main access roadways inbye to ensure that they will not present any unnecessary hazards?

(7) As a newly appointed manager of a large and highly mechanized colliery, to what features of the layout and equipment of the mine would you direct attention in order to assess the potential fire risks, and what precautions would you take to minimize these risks?

(8) A development heading, rising at a light gradient, in a seam, has approached an upthrow fault. Old dip workings of a lower seam in the sequence extend to the fault on the upthrow side, and datum levels establish that the floor of the heading will pass 40 ft. below the floor of the old workings at the fault. The heading is to be driven through the fault to develop a seam below the old workings. The old workings are now inaccessible and are believed to contain a dangerous accumulation of water.

Make a section sketch of the conditions stated and describe the precautions you would take in driving the heading through the fault and any subsequent arrangements you would make to ensure the safe working of the new district. Assume any special conditions you consider necessary.

Machinery

(1) What restrictions are placed on the operation of Koepe or friction winders which do not necessarily apply to the operation of drum winders?

Calculate the maximum acceleration that can be given to the rope of a friction winder if the ratio of the tensions in the rope on the ascending and descending sides of the driving pulley is not to exceed 1.8, assuming that the static loads on the rope at these points are 32 tons and 22 tons, respectively. The effect of guide friction and wind resistance may be neglected.

(2) A turbine pump running at 1,470 r.p.m. is to be used for dewatering a mine, and the total head against which it delivers water will increase from 600 ft. to 2,000 ft. as the work proceeds. Estimate

the number of stages required in the pump and state how many of them may be omitted initially. Calculate also the b.h.p. developed by the motor at the maximum head if the efficiency of the pump is 74 per cent.

(3) State what determines (*a*) the carrying capacity of a belt conveyor, (*b*) the power input required, and (*c*) the maximum length of the conveyor.

Calculate the power required to drive a belt conveyor to carry run-of-mine coal, at the rate of 120 tons an hr., over a distance of 1,000 ft. up a uniform gradient of 1 in 10. Assume that 50 per cent. of the power is absorbed in overcoming frictional resistance to motion.

(4) The maximum permissible tension in a 6-ply belt, 6 in. wide, is 17 lb./in. per ply. The belt is to transmit the drive between a 3-phase, 4-pole a.c. motor, with a 6-in. dia. pulley, and a fan with a 12-in. dia. pulley, the distance between the pulley centres being 10 ft. Calculate the maximum h.p. which the belt can transmit if the coefficient of friction between belt and pulley is 0.25 and the frequency of the electrical supply is 50 cycles/sec.

(5) What causes a low power factor in a 3-phase system and why should it be avoided?

Calculate the power factor of a 3-phase motor which develops 42 b.h.p., with an efficiency of 95 per cent. when it is supplied with 40 amps at 550 V.

(6) Describe three different methods of starting a synchronous motor. Where might such a motor be employed in or about a mine and what advantage could be claimed for it?

(7) Make a sketch of a 3-phase mercury-arc rectifier and describe its operation and function.

(8) Making use of suitable schematic diagrams, describe the Ward Leonard control system for winders.

FIG. 2.

Surveying, Levelling, and Drawing

(1) The plan (Fig. 2) shows surface contours in feet above Ordnance Datum and the outcrop of a seam at points A, B, and C. Assume that the seam is of uniform gradient and, from the information given, mark on the plan the direction and rate of full dip and the line of outcrop of the seam.

(2) Table 2 gives notes of an underground traverse survey. Calculate the azimuth, length, and gradient of a drift to connect stations A and F.

TABLE 2.

Line.	Azimuth.		Distance.	Inclination.
	deg.	min.	ft.	deg.
AB	89	54	350	—
BC	150	12	190	—
CD	180	00	600	—
DE	140	18	155	+28
EF	228	36	800	−12

(3) An underground road is being regraded on a uniform gradient of 1 in 120 starting from a point A, set at a level of 8,168.4 ft. above a datum 10,000 ft. below Ordnance Datum. Inbye from A, grade-marks, numbered 1 to 9, are set at 100-ft. intervals along the sides of the road. Table 3 shows notes of a levelling made to check whether point A and the grade-marks have been disturbed while the work has been in progress.

Calculate the level of each staff station reduced to a datum of 10,000 ft. below Ordnance Datum

TABLE 3.

Back sight.	Inter sight.	Fore sight.	Rise.	Fall.	Levels reduced to a datum 10,000 ft. below Ordnance Datum.	Dist. ft.	Remarks.
4.28					8163.98		Bench Mark
3.32		2.19					
3.19		1.21					
	2.99					0	Mark A
	3.84					100	Grade Mark 1
	4.71					200	Grade Mark 2
0.90		5.52				300	Grade Mark 3
	1.70					400	Grade Mark 4
	2.52					500	Grade Mark 5
	3.32					600	Grade Mark 6
	4.18					700	Grade Mark 7
	5.02					800	Grade Mark 8
		5.86				900	Grade Mark 9

and state the amount of vertical disturbance (if any), at A and each of the grade-marks as disclosed by the check levelling.

(4) List the equipment required and describe a method of carrying out a theodolite survey underground. Describe the method of measuring horizontal and vertical angles and distances, respectively, and state the important points to which attention should be paid to ensure accuracy of both angular and linear measurements.

(5) An old shaft 12 ft. dia., sunk to a depth of 250 yd., is flooded to 20 yd. from the surface and there is an incoming feeder of 30 gal./min. Calculate the time to unwater the shaft, using a sinking hoppit or kibble, 4 ft. 6 in. dia. at the top, 3 ft. 6 in. at the bottom, and 4 ft. deep, assuming that it is filled to 90 per cent. of its capacity each journey and that 15 journeys are made per hr.

(6) A heading AB driven direct to the rise in a seam at a gradient of 1 in 6 and in a direction due north strikes, at B, an upthrow fault bearing at right angles to the heading and hading 30 deg. from the vertical. From B, a cross-measures drift, driven in the same direction as the heading, has recovered the seam at a position 420 ft. from the upper side of the fault as measured in the seam. The difference in level between the beginning and end of the drift is 265 ft. Assume that the direction and rate of dip of the seam are the same on both sides of the fault and calculate:—

(*a*) the vertical displacement of the fault and

(*b*) the length and gradient of the drift.

(7) For the purpose of correlating surface and underground surveys at a mine two wires have been suspended in one of the shafts. List the equipment required and describe, with the aid of sketches, a method of carrying out the correlation.

(8) The co-ordinates, in links, of two stations B and C in relation to another station A, are as follows:—

Station	*Latitude*	*Departure*
B	N.576	E.215
C	S.750	E.800

Calculate the radius, to the nearest chain, of a circular curve passing through the stations A, B, and C.

Mining Legislation

(1) Describe the requirements for the determination of the firedamp content in the return air from a longwall face, in accordance with the Ventilation Regulations.

(2) State the provisions of the Act relating to the ventilation of a "waste."

(3) The Electrical Regulations specify standards for the insulation of any conductor and the earthing of apparatus. Describe these.

(4) Describe the method of the preparation, maintenance, and custody of Cardox and Hydrox shells, as specified by the Regulations.

(5) Describe briefly the requirements for the prevention of overwinding at a deep shaft ordinarily used for carrying persons through it by mechanically operated winding apparatus, including the testing of the equipment.

(6) State the arrangements to be provided at a large mine relating to the transference of a badly injured person from the place of accident to hospital or to his home, including the means of conveyance through a shaft or unwalkable outlet and the ambulance arrangements. (First-aid treatment may be assumed.)

(7) Describe briefly (*a*) the pre-shift inspection required to be made of a deputy's district, and (*b*) the inspections to be made during the shift by the deputy. Also state the types of lamp to be used by him during these inspections.

(8) State the statutory duties of the training officer at a large mine, and define "instructor" and "supervising workman" according to the Training Regulations.

Mining Technology

(1) Discuss the problems associated with gaining access to coal measure strata through a superficial deposit of 100 ft. of running sand by (*a*) vertical shafts, and (*b*) inclined drifts. Give the advantages and disadvantages both in connection with the initial drivages and in the use of these accesses when completed.

(2) At a large modern colliery it is suspected that the production of dirt is increasing. Describe the procedure you would adopt to investigate (*a*) how much dirt the colliery is producing, and (*b*) the sources of the dirt. If the results show that an excessive proportion of the dirt output comes from back rippings, what measures could be taken to bring about a reduction?

(3) Describe any underground locomotive haulage system with which you are familiar or which you have read about, giving as full details as possible.

(4) Describe, with the aid of sketches, the field of use of roof bolts in mines. Discuss the factors to which attention should be paid to ensure that bolt installations are safe and efficient.

(5) Describe as fully as possible the organization needed to get the maximum rate of drivage in a level cross-measures drift 16 ft. wide by 13 ft. high.

(6) State the merits and demerits of parallel firing from the mains in sinking shafts, and describe the procedure for charging and connecting up the round when this technique is adopted.

(7) Give as full details as possible of the emergency organization which should be ready and available at any colliery in the event of a serious mishap.

(8) Discuss the factors to which attention should be paid in planning a pit-bottom layout. Sketch a layout suitable for a landing to which 1,000 tons of coal per shift is hauled by diesel locomotives in 3-ton mine cars.

(9) Discuss the effect of increased mechanization in longwall production units on the risk of explosions of firedamp and/or coal dust, and suggest how any additional hazards may be minimized.

New Literature

MENTION is made below of some of the house magazines, catalogues, booklets, and other publications received. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

JOSEPH WRIGHT & COMPANY (FABRICATIONS), LIMITED, Pear Tree Lane, Dudley—Features of the fully heat-treated SMRE roadhead bar are outlined and illustrated in an attractive new pamphlet.

A. REYROLLE & COMPANY, LIMITED, Hebburn (Co. Durham)—Type-SGA3 flameproof airbreak circuit breakers have been developed to meet the National Coal Board standard specification No. 209/1960 for the control of main distribution circuits in medium-voltage systems. The design supersedes the type-GA3 panel which has been extensively used in the mining industry for similar duties. The new type is described in an attractive new publication (pamphlet 1326).

EFCO FURNACES, LIMITED, Queens Road, Weybridge (Surrey)—"Gas Carburizing and Chicken Feed" is the somewhat intriguing title of an article by E. Hague in the May issue of the Efco Journal. Reading on we learn how Richard Sizer, Limited, of Hull, whose special concern is machinery for the production of meal cubes and pellets for feeding cattle and poultry, evolved a machine to deliver the meal in regularly sized pieces. The other main contribution is a further instalment of H. Knight's article on "Production Heat Treatment by High-frequency Induction."

MINISTER OF INDUSTRIAL DEVELOPMENT, Government of Western Australia, c/o Savoy House, 115, Strand, London, W.C.2—A team of nine British industrialists visited Western Australia in October, 1960, at the invitation of the State Government. The objectives of the visit were to investigate opportunities to establish new industrial capacity, and generally to stimulate wider interest in the UK in the development of secondary industries in Western Australia. Published under the title "Opportunities for Industrial Investment in Western Australia," it is a very readable document of 50 pages and will be found of great value by those interested in the subject.

BRITISH OXYGEN COMPANY, LIMITED, Bridgewater House, Cleveland Row, St. James's London, S.W.1—Accompanying the June issue of Pennant, the company's monthly newspaper, is a four-page supplement commemorating British Oxygen's 75th anniversary. In words and pictures there is a most interesting account of the company's growth from the days when it was launched "in a small and precarious way" up to the present when it "has reached a position of growing strength and importance in our country's economy." Here, then, are plenty of facts and figures, and names, too—names of some of the personalities who have helped to bring about the successful development of the organization.

CAMBRIDGE INSTRUMENT COMPANY, LIMITED, 13, Grosvenor Place, London, S.W.1—The Cambridge indicating pneumatic temperature controller, described in List 103, is an instrument for controlling the working temperatures of vats, autoclaves, or other similar containers, and the temperatures of refrigerating, air-conditioning, or other similar plants and processes, between −20 deg. C. and +340 deg. C. The instrument can be used in almost any industrial process where the flow of heating or cooling medium can be regulated by a diaphragm valve. The company's electrochemical dissolved oxygen analyser, Mark IV, which provides accurate and continuous measurement of microgram quantities of dissolved oxygen in the feed-water of modern high-pressure steam plants in generating stations, is described in List 323/3, while Supplement A to List 323 describes the dissolved hydrogen analyser which has been designed to measure H_2 concentrations within the range 0 to 0.02 parts per million by weight.

BRITISH IRON AND STEEL FEDERATION, Steel House, Tothill Street, London, S.W.1—Safety, the magazine of accident prevention and industrial health, certainly does not pull its punches in its efforts to bring home to all concerned the urgent need for reducing the accident rate in the steel industry. The summer number of this excellent publication tells us that the provisional accident rate for the first quarter of 1961 (2.14) made a significant drop compared with the rate for the same quarter of last year of 2.27. The rate for young people stands at 2.27, compared with 2.88 in the first quarter of 1960. But, says the editorial, "The accident rate for young persons in parts of the steel industry is higher now than it was five years ago." The writer is prompted to state that "in sections of the industry something is wrong with safety training, or enforcement." Safety considers it worthwhile devoting a whole page to tell us that there are 500 eye injuries a year in the industry, and another page to inform us that there are about 3,800 injuries to legs and feet a year, and yet another page to driving home the fact there are about 3,700 injuries to hands a year. The space is used wisely. Other pages complete the story of the accident trend and further space is devoted to constructive suggestions as to how the rate can be reduced with a little care and attention. Safety—every issue is a good one—should be read carefully by all engaged in making British steel.

Australian Scrap Export Quotas Unchanged

INTIMATING that there would be no change in the present quotas on exports of iron and steel scrap in the second half of this year, Mr. J. McEwen, the Deputy Prime Minister and Minister for Trade, said:

"In announcing last August a reduction of quota exports in the first half of 1961, I referred to a number of new scrap-using projects planned for the production of pipes and other items, and to the likelihood of still further reductions being made in quota exports and possibly other categories in the second half of the year.

"Several of these new projects have been delayed or modified and it now appears that scrap supplies will be adequate for requirements in 1961 without further reduction of exports. Accordingly, quota exports in the second half of this year will remain at the level of 15,000 tons."

New Company to Market Process Control System

NEW joint British company—with headquarters in London—has been formed by the General Electric Company, Limited, and Thompson Ramo Wooldridge Inc. (TRW), of Los Angeles. Its first chairman is Mr. O. W. Humphreys, GEC's technical director.

MR. O. W. HUMPHREYS

The purpose of the new company—International Systems Control, Limited—is to market industrial process control systems in Britain, the European Free Trade Area, and the Commonwealth and it will start with a capital of £430,000, equally shared by the parent companies. TRW's contribution is to provide "know-how" of process control systems including computer designs, and GEC is making available relevant patents, key personnel, and in particular, its advanced electronic engineering resources, and its experience and extensive facilities for the manufacture of precision electronic equipment.

ISC will apply the knowledge and experience of both partners in designing the control system for each process. The RW 300 system incorporates the first computer specifically designed for the completely automatic control of industrial processes. In addition to controlling the physical conditions, such as the flow of materials, temperatures, and pressures, the computer does a variety of related recording tasks to cover the whole system.

GEC is already interested in the control of operations in steel rolling mills and it is believed that the new company will find fresh scope for its activities in steel manufacturing and processing and also in coal mining.

In addition to Mr. Humphreys, the members of the board of the new company are as follows:—Dr. D. N. Truscott, previously general manager, electronics division, GEC telecommunications group (managing director); Dr. E. M. Grabbe, senior staff consultant on automation for TRW (deputy managing director), Mr. G. W. Fenimore, vice-president, TRW International, Mr. W. A. C. Maskell, managing director of the GEC telecommunications group, and Mr. M. E. Mohr, vice-president, electronics systems and equipment group, TRW.

Australian Iron and Steel Output

COMBINED production figures for May of the Broken Hill Proprietary Company, Limited, and the Australian Iron & Steel Proprietary Company, Limited, are (in tons):—Coke, 220,955; pig-iron, 267,554; steel ingots, 326,550; boom and slab mills, 284,930; heavy and continuous mills, 176,778.

Plate and strip mills, 92,585; merchant mills, 118,165; rod mills, 12,522; cold rolling mills, 3,337; tinplate, 9,705; steel foundry (excluding ingots) 1,149; iron foundries, 8,954; spun pipes, 5,923.

New London Showroom for G. A. Harvey

"VIGOROUS, versatile, and venturesome"—these alliterative adjectives were used by Mr. Paul Reilly, director of the Council of Industrial Design, on Monday, when he officially opened the new head sales office and showroom of G. A. Harvey & Company (London), Limited, in the new Villiers House which dominates the west end of the Strand, London.

Mr. Reilly was referring to the 87-year-old company which was founded in Lewisham by George Alfred Harvey to produce such articles as gutters and cistern linings and which now produces a wide variety of goods in heavy fabrication, light fabrication, sheet metalwork, metal perforation, and galvanizing.

The new offices and showrooms have an area of 6,500 sq. ft. and new branch offices and showrooms of similar style and each of about 1,200 sq. ft. in area have recently been opened in Bristol, Leeds, and Glasgow. Three more will be opened in July in Manchester, Liverpool, and Birmingham.

The firm's works moved to Greenwich in 1913 and now occupies an area of 28 acres. There are a further two acres at the Margate factory.

Park Gate Iron & Steel to Minimize Smoke and Dust

STEPS to be taken by the Park Gate Iron & Steel Company, Limited, to reduce nuisance from smoke, dust, and chemical emission from its works at Rotherham (Yorks), include the replacing of steam by diesel-electric locomotives—by the end of July, 12 steam locomotives will have been replaced. Oil-firing installations for the boilers are now complete and two reheating furnaces will be converted from coal-firing to oil-firing by January, 1962.

Inferior quarry gradings of ore have now been discarded. This is one of the difficulties arising from blast furnace operation, says the statement. A third quarry also with better ore will soon replace an inferior site.

Improvements have also been made to other various fittings in the plant and one blast furnace is scheduled to be rebuilt and relined.

Ductile Steel Celebrates its Silver Jubilee

LAST Saturday Ductile Steels, Limited, of Willenhall (Staffs), celebrated its silver jubilee as a public company. It started as a private company in 1932 and was originally formed from the resources of two companies of stockists and merchants, for the manufacture of cold rolled steel strip. Ductile Steels, Limited, itself, is now a holding company for ten subsidiaries, manufacturing a variety of steel products.

The first production planetary mill in the world was installed by the company, and now operates as a separate subsidiary company, Ductile Planetary Mill, Limited. In addition, it is also one of the largest stockists of steel sheet in the country. Growth of the company can be judged from the fact that in 1936 it made a trading profit of about £25,000, whereas last year trading profit was over £1,000,000.

African Notes

ISCOR AT FULL CAPACITY

Allocation of Steel Products Continues

PRODUCTION in May by the South African Iron and Steel Industrial Corporation, Limited (ISCOR), remained at full capacity. The overall level of demand was strong, and distribution of steel products continued on an allocation basis, except for wire rod, coiled rounds of up to ⅜ in. dia., and window sections, which were freely offered. The demand for heavy and medium mill products was stronger than for light mill products, but both Iscor mills nevertheless operated at full capacity.

Plates and cold rolled sheets continued in strong demand, but the call for hot rolled and galvanized sheets eased considerably, and it was possible for additional tonnages of these to be offered. As a result of the easing in demand in the Union for certain products, increased quantities were offered to the Federation and other neighbouring territories. No oversea export orders were accepted, however.

The latest available figures show that there has been an increase in steel imports into South Africa, but these consisted mainly of items not produced in the Union and of products which normally enjoy a demand in excess of local capacity.

Opening New Coalfields

Possibility that some of South Africa's more difficult coalfields will be opened up in the next few years has been heightened by the recently announced plans for increased steelmaking capacity at Iscor, according to Mr. T. Coulter, chairman, in his report on the African & European Investment Company, Limited. The report mentions that collieries have begun to feel the effects of the railways' schemes for modernization. After steadily increasing for years, the demand for coal by the railways has started to fall, mainly as a result of the greater use of diesel and electric locomotion.

The industry is anxious about its ability to retain the hard-won export markets of Ceylon and Burma, and Mr. Coulter says it is hoped that political factors, which have assumed such importance, will not sever connection made after much effort and trouble. Apart from internal consumption, about 1,020,000 tons of coal were sold to neighbouring territories, for bunkers, or exported. Of exports, 513,100 tons went to Burma or Ceylon.

The Vanderbijl Engineering Corporation, Limited (Vecor), an associated company of Iscor, has recently established a projects department with the intention of undertaking complete projects. Up to the present, Vecor's activities have been mainly in the manufacture of heavy industrial equipment, while in 1953 it began to erect the equipment produced at its plant. The new department will extend this activity, so that it can accept orders for complete projects from the initial stage to the commissioning of any project.

Work at both coal prospects in Swaziland has now stopped, and all shafts have been sealed off. The preliminary diamond-drilling programme on the copper-nickel-cobalt complex near Mhlambanayati has been completed, and geological mapping of the entire area of 125 sq. miles is continuing. Recently further zones of copper mineralization, in addition to interlayered horizons of titaniferous magnetite, have been discovered.

Expansion of Southern Rhodesia's mining industry this year is likely to lead to a new record in mineral output exceeding last year's £27,000,000 record production. The Government's mining reports, recently published, promise future development of a number of mineral deposits in the colony. The interest shown in iron ore by Japanese industrialists has started inquiries from local and foreign mining houses, and contracts for from 200,000 to 1,800,000 tons of ore a year have been offered. Exploration of the large, untouched coalfield near Beit Ridge has advanced to the stage where a rail link with the Bannockburn-Lourenço Marques line is under consideration. The proposed colliery would produce a high-grade coking coal suitable for the steel industry.

Northern Rhodesia has maintained its position as the second largest producer of copper among non-communist countries for the second year, according to the Chamber of Mines Yearbook for 1960, published recently. The copperbelt smelted 634,451 tons last year, about half the 1,229,000 tons produced in the United States, but substantially more than Chile's 556,307 tons.

Nuclear power stations might prove economic in parts of South Africa where water is not readily available, Sir Basil Schonland said recently in an address to the Associated Scientific and Technical Societies of South Africa. While nuclear reactors elsewhere were fast arriving at the stage where they could compete with coal, it was a different story in South Africa, where coal was the cheapest in the world. "However, with the development of the latest gas-cooled reactors, it might become economic to use them water is not readily available," he said.

The new Eastern Nigeria steel rolling mill now under construction at Emene, eight miles east of Enugu, will come into production before the end of the year. The building, which covers an area of 65,000 sq. ft., is expected to be set up by August, followed by the installation of plant and machinery. The plant will cost £130,000, and the factory will turn out £700,000 worth of products annually. Also at Emene, a new £2,000,000 asbestos cement factory is to be built by Turner & Newall, Limited, of the UK. The factory will eventually provide 17,000 tons of asbestos products a year.

Orders Placed

British Share in French Sinter Plant

IMPORTANT share of a £1,000,000 order for a sintering plant to be supplied to the Société Pour le Traitement du Minerai de Saizerais, Lorraine, France, has been obtained by Head, Wrightson Iron & Steel Works Engineering, Limited, a subsidiary of Head, Wrightson & Company, Limited, Thornaby-on-Tees (Yorks).

The contract for a 3,000 ton-per-day installation was obtained by Société Fives Lille-Cail, in conjunction with the Thornaby firm. Much of the fabrication will take place in France, but the engineering and drawings will be carried out by the Head, Wrightson firm.

ORDER FOR textile machinery worth £400,000 was secured at the Posnan Fair by Prince-Smith & Stells, Limited, a member of the Stone-Platt Industries, Limited, group.

A CONTRACT FOR 72 industrial diesel engines has been placed with Ashok Leyland, Limited, of Madras, by Consolidated Pneumatic Tool Company (India) Pvt., Limited, of Bombay.

THE BELL-TYPE FURNACE installation for the bright annealing of copper under vacuum conditions which has been ordered by Pirelli-General Cable Works, Limited, is being designed and manufactured jointly by the General Electric Company, Limited, and Vacuum Industrial Applications, Limited.

CONTRACT WORTH £500,000 has been received from the Curaçao Government by Richardsons, Westgarth & Company, Limited, for two vacuum flash evaporators each capable of producing 1,400,000 gal. of drinking water a day. The company states that the units have a larger individual output than any evaporator in the world.

FOR THE FOURTH year in succession, Pritchett & Gold & E.S.P. Company, Limited, London, S.W.1, has received an order to supply the complete battery requirements of the Kowloon Motor Bus Company (1933), Limited, of Hong Kong. One of the largest privately-owned bus fleets in the world, the Kowloon Motor Bus Company comprises about 640 vehicles, both double and single-deckers and all of British manufacture.

TUBE PRODUCTS, LIMITED, Oldbury, Birmingham, has received a £300,000 contract for electrically-welded finned steel tube for the Dungeness nuclear power station. This follows contracts for similar extended surface welded tubing, to a total value of over £2,000,000, placed with Tube Products for the Hunterston and Trawsfynydd nuclear power stations in the UK; the Latina project in Italy, and the Tokai-Mura project in Japan.

UNDER A CONTRACT worth about £1,000,000, the 33kV L42T/L45T switchboards at present being erected at the main sub-station of the new Spencer steelworks of Richard Thomas & Baldwins, Limited, at Llanwern, South Wales, have been supplied by A. Reyrolle & Company, Limited, together with the 275 kV air-blast switchgear for the Whitson sub-station. Some of the 3.3kV equipment and all 33kV and 11kV switchgear for the new plant is to be supplied by Reyrolle.

Managing director of the English Electric Company, Limited, Mr. HENRY GEORGE NELSON has been appointed a director of the Bank of England.

Fletchers Return to Mining Industry

DESFORD hydraulic chocks of a new design have been installed in recent months in collieries in the East Midlands Division of the NCB by George Fletcher & Company, Limited, Masson Works, Litchurch Lane, Derby.

The chocks, designed in a range of sizes, can work with a 14-in. stroke in a 3 ft. seam or with an 8-in. stroke in a seam of 2 ft. 1 in. The relief valve mechanism with the chocks can be set, according to specification, to provide a range of working loads from 50 to 100 tons. Auxiliary equipment includes double-acting hydraulic rams with up to 2 ft. 6 in. stroke, extension pieces, and detachable ram anchor brackets.

By the introduction of hydraulic roof support systems, George Fletcher & Company, Limited, expect to return in strength to an industry in which they were leading manufacturers some 40 years ago. The company aims to relate knowledge, experience, and engineering techniques gained in other manufacturing fields to the redesign of traditional mining equipment.

NCB Studies Cause of Drift from the Pits

SERIOUS efforts to stop the drift from the mines, especially of trained apprentices, are being made by the National Coal Board and it is hoped that a survey now being taken will provide the board with statistical details of the defects and the causes for them and will help the board to discover some means of preventing the wastage.

Recently, Mr. Alfred Robens, chairman of the NCB, said the board was losing as many as 5,000 trained apprentices a year because of "poaching" by other industries. As it costs as much as £500 to produce a trained craftsman and as other large industrial concerns do not lose as many men as the mining industry, the NCB wants to remedy the position, although the problem is not a new one in mining.

The board knows the chief reason is a social one, as many men between the ages of 30 and 40 are leaving the industry because they are influenced by their wives and families to move to some more congenial occupation. Men are offered more money in other industries than they can get at the pit, where a round-the-clock shift system of eight hours is worked, whereas a factory can offer a working day which will give a man his evening free with his family.

ALLIED INDUSTRIAL SERVICES, LIMITED, manufacturers of industrial protective clothing, of Glasgow—Following the maintained 7½ per cent. interim, the final dividend is 22½ (20) per cent. making a total of 30 (27½) per cent. for the year to March 31, 1961. Net profit, attributable to the company, after tax, increased to £593,714 (£545,734). A proposed one-for-10 scrip issue will capitalize £187,500 of general reserve and will be made to ordinary holders registered on July 3. An extra-ordinary meeting to increase the capital and give effect to the recommendation will be held following the annual meeting on July 20.

CHEAP U.S. COAL

Drive to Regain West German Market

IN what appears to be a US offensive to regain lost coal markets in West Germany, long-term contracts are reported to have been offered to West Germany at prices which, even after paying the German coal duty of about DM30 (about £2 14s.) per ton, would be no dearer than Ruhr coal in cities outside the coastal areas. Figures quoted of about $9.50 per ton f.o.b. Atlantic port, would mean $14 c.i.f. German port. In coastal areas US coal is already almost £1 cheaper than equivalent German coal.

This is partly because of cheaper transport costs from the port and partly because coastal areas benefit from a duty-free quota of 3,500,000 tons of US coal per annum. Actual imports from the US last year reached 4,500,000 tons compared with more than 11,000,000 tons in the peak years. Ruhr collieries have provided against the re-emergence of US and other imports of coal by concluding long-term delivery contracts wherever possible.

As a source of energy the sale of coal in West Germany fell from 67 per cent. in 1957 to 58 per cent. in 1960 and oil sales gained the thermal equivalent of 19,000,000 tons of coal during the same period. The Ruhr collieries' loss last year has to some extent been hidden by the deliberate reduction in production from 150,000,000 tons in 1957 to an estimated 140,000,000 tons this year.

Ruhr's Rationalizing Efforts

Pithead stocks of coal and coke were reduced to below 11,000,000 tons at the end of 1960, but have now climbed beyond the 13,000,000-ton mark. The ECSC High Authority estimates that German demand for coal this year, compared with last, will fall by 3,70,000 tons to 132,700,000 tons. As part of their diversification plans some of the biggest coal companies are competing in the market for oil.

Determined efforts are also being made to expand facilities for generating electricity from their own coal. By the end of 1959 the Ruhr coal companies owned power stations with an aggregate capacity of 3,400 kW. This has risen to 4,300 kW, and by 1965 the 5,000 kW mark is expected to be passed. Last year 12,000,000 kWh of electric power were sold from these colliery-owned power stations.

As the result of progress made in rationalization, the Ruhr's output per manshift worked underground has risen from 1,606 kilos in 1957 to about 2,000 kilos last year and is still going up. Mechanization has played its part, but so has the closure of marginal pits. Since 1957, 16 pits with an annual capacity of more than 6,000,000 tons have been closed or scheduled for closure, almost all in the Ruhr, and another 17 have been merged to reduce overheads.

Meanwhile at the meeting of the Council of Ministers of the European Coal and Steel Community at Luxembourg last week, Professor Erhard, the West German Economics Minister, proposed that Article 65 of the treaty setting up the community should be revised to allow Germany to establish a unified coal sales organization. At present coal sales are carried out by three independent groups. Article 65 prohibits all agreements and practices tending to restrict competition, to control production, limit prices, or allocate markets and sources of production.

The coal owners' claim for the reconstitution of the Ruhr coal cartel is supported by the West German Government. They state that the existence of a unified coal-selling syndicate for the Ruhr collieries would facilitate the adaptation of the German mines to the present power surplus. The effect of the proposed amendment to the ECSC treaty would be to enable the High Authority to authorize the creation of unified selling or buying syndicates, whether for coal or for steel, in order to enable the industries concerned to deal with new circumstances.

In the form resulting from last week's discussions, this power will be severely qualified. It will be necessary to show in advance that the industry concerned is suffering from structural difficulties; the authorization may be given only as a temporary measure; before authorization is given the industry concerned must create an organization for its own reorganization, with a view to making the selling syndicate or buying syndicate unnecessary, and throughout the period of the authorization the High Authority will have a mandate to supervise the use made of it to ensure that there are no abuses and that reorganization is, in fact, occurring.

"Phenomenal Rise" in US Energy Requirements

DEMANDS for energy in the United States have been accelerating at a "phenomal rate," and on the basis of various estimates, its energy requirements could double by 1975 and double again by the turn of the century, said Mr. Stewart L. Udall, Secretary of the Interior, when speaking in support of a national fuels and energy study before the Senate Interior and Insular Affairs Committee.

Mr. Udall said that more than ever before, world-wide social doctrines and political events were tied to industrial development, and energy resources were fundamental to this development. "If we are to maintain our own domestic well-being, as well as meet our world-wide responsibilities, we should now review our own energy situation in relation to the total situation confronting us. We should weigh carefully all the implications of the fact that we have become on balance an energy-importing nation."

Saying that action should be taken now to insure against an energy gap, Mr. Udall said that a study of fuels and energy by a Senate committee, and appropriate action, would go far toward assuring that the US would never be faced with such a gap.

Obituary

Loss To Scrap Metal Trade

FOR the past four years secretary of the National Federation of Scrap Iron, Steel, and Metal Merchants, Mr. Leonard H. Cryer died in hospital on Monday. Mr. Cryer, who was 64, had been working in his office in Chancery Lane, up to the weekend. He was widely known both in this country and abroad, not only for his work on behalf of the federation but also for his unusual grasp of the many applications of metals and metallurgy.

For 40 years he had been a civil servant, most of his service having been spent with the Ministry of Supply. It was in this capacity that he was brought into touch with the scrap metal industry in Britain and oversea. He was appointed to the Imperial Service Order several years ago for special duties which he undertook in Germany in the liquidation of British service resources there after the last war.

Mr. BERTRAM SIMON, safety and fire prevention officer with the Welsh Tinplate & Metal Stamping Company, Limited, Llanelly, died recently. He was 52.

The death occurred last week of Mr. HAROLD HALFORD, commercial manager for the last 15 years of Arthur Lee & Sons, Limited, makers of hot and cold rolled strip, etc., of Sheffield. He was 63.

Mr. MATTHEW WILLIAM SIMPSON, training officer at Bolsover Colliery (Derbyshire), has died at the age of 57. He had been connected with the coal industry for 43 years, and began his career in Northumberland.

The death has occurred of Mr. W. L. DYMOND (68), who was employed at the Orb works, Newport (Mon), of the Steel Company of Wales, Limited, for 54 years, serving as head of the works pay office and on the managerial side dealing with rates and negotiations.

Mr. HERBERT SMITH, a saw manager with the Neepsend Steel & Tool Corporation, Limited, Sheffield, for many years, before going to Australia seven years ago to open up a saw manufacturing plant for a company there, has died suddenly in Melbourne at the age of 57.

Former director of the Darlington Railway Plant & Foundry Company, Limited, who retired in 1958, Mr. ROBERT BLAYLOCK has died at the age of 74. He joined the firm when he was 14, eventually taking charge of the drawing office. In 1937 he was appointed works manager and, nine years later, became a director.

Francis Shaw Forecasts Favourable Profits

GOOD level of profits can be achieved in the current year, state the directors of Francis Shaw & Company, Limited, makers of machinery for the rubber, hydraulic, and plastics industries, of Manchester, who warn, however, that in the face of keen competition at home and oversea it is not always possible fully to recover extra costs by increasing selling prices.

Mr. J. G. Mackay, chairman, says that during the second and third quarters of 1960 deliveries were substantially less than those for the corresponding period of 1959, and although a substantial recovery was later made, the year's deliveries were below those of 1959. A further reason for the reduced 1960 profits was that certain export contracts taken at keen prices in face of severe competition from abroad, proved unremunerative, partly on account of difficulties in design and manufacture.

"Vital Need" of Automation in British Industry

OPENING a conference on the social and economic effects of automation at Harrogate on Tuesday, Lord Hailsham, Minister of Science, said that Britain could no longer depend on the economic reliability of its established technical skills. Emphasizing the vital necessity of automation, on which the future of Britain so largely depended, he said that without this process there was no hope of our retaining competitive power against people with a lower standard of life, who were already mastering some of the techniques of mass production.

Without automation we should be successfully competed against and beaten in one field after another, he warned, and we should be priced successively out of the market in every case where lower wages and equal or almost equal industrial skill could be assembled and brought to bear. Relations with the unions, as a result of automation, would be deeply affected, but he thought the unions saw this very clearly.

Mr. J. A. C. Brown, senior research officer at the Department of Applied Science, University of Cambridge, reviewing the economic implications of automation, said it seemed certain that "if automation is to be a significant factor in accelerating our rate of growth and adapting the British economy to face a changed pattern of international trade, the problems of its introduction and extension need to be thought out over the medium- or long-term rather than only a short-term perspective."

It was in setting this perspective of thinking, say with a horizon of about 10 years, that the economist could make his most positive contribution, said Mr. Brown.

The conference was under the auspices of the British Conference on Automation and Computation. It was organized by the British Institute of Management.

New Home District Offices Division for AEI

NEW division of Associated Electrical Industries, Limited, has been formed to manage the company's home district offices. Mr. V. S. Risoe has been appointed general manager of the new division and will take up full time duty on August 1. After serving with AEI subsidiaries in India, he joined the board of AEI Overseas, Limited, in 1956. In 1959 he joined the board of the First Electric Corporation of South Africa, Limited. He will be resigning from both boards on August 1.

The group also announced that Mr. A. T. Stretton has been appointed assistant manager of the small industrial machines engineering department, Birmingham, AEI motor and control gear division. He joined the British Thomson-Houston Company, Limited (now AEI (Rugby), Limited, in 1923 as an engineer apprentice, and in 1946 became senior mechanical design engineer in motor engineering and small industrial machines engineering department.

CENTROMOR, of Warsaw, the Polish Government's central import and export office, has placed an order worth £500,000 for 13 6-cylinder diesel engines with Mirrlees Bickerton & Day, Limited.

IRON AND STEEL TRADE

DEMAND for some categories of structural steel has eased to such an extent that there are persistent forecasts of an even more widespread reduction in the number of shifts worked per week and more short-time working to come. The demand for universal beams is stronger than for other heavy sections, but even though only two such mills are in operation in this country, both could accommodate more orders. Although there has been a spurt recently in orders for large diameter steel tubes, this section of the industry is generally slack, particularly in export business which has constituted the bulk of the trade.

Pig-iron

So far as pig-iron is concerned the recent permitted increase in price—far from averaging 10s. a ton—works out at between 4s. 1d. and 4s. 9d. a ton. While the demand for all grades of pig-iron is reasonably steady, it is nowhere near the level it could be and without placing any great strain on the makers. There is little forward buying and orders cover mainly for current consumption plus the working stock required to ensure uninterrupted production.

The engineering and speciality foundries maintain their comparative supremacy in the call for pig-iron supplies and they are taking fairly substantial quantities of low phosphorus iron and hematite and, to a lesser extent, the refined irons.

Ferro-alloys

Ferro-tungsten remains unchanged in price and the demand has become quiet. Ferro-molybdenum is in reasonable request and ferro-vanadium is fairly active, as is ferro-silicon, while ferro-chrome and ferro-manganese receive moderate support.

There is a fair demand for ferro-titanium and ferro-niobium.

Semi-finished Steel

The re-rollers are striving to improve on their meagre order-books for small bars, light sections, strip, etc., but the available business declines and in many cases orders are insufficient to make up full rolling tonnages. The re-rollers of reinforcing rods and bars are better placed as the demand for these continues heavy.

Supplies of mild steel semis are adequate and home steelworks could easily cope with a much larger demand. The shortage of alloy and carbon steels which persisted for so long, has now eased to a great extent and only isolated cases of difficulty are reported.

Finished Steel

Makers of sections and joists are having to include more sizes in their rolling arrangements in order to keep up production and, although this is acceptable to the consumer, it does not help the steelmaker who would appreciate more specifications to fill up available capacity in forward rollings. Plate makers are gradually reducing their backlog of orders and with the output from new plant increasing are able to undertake new business for fairly reasonable delivery.

With many shops having capacity available, competition for structural steelwork is very keen indeed with the result that prices and delivery dates have been cut to the minimum in order to secure further business.

F. PERKINS, LIMITED—Mr. Francis E. Collis has been appointed a director.

Spectrometer Equipment for Material Analysis

RECENT addition to the range of equipment of the Solartron Electronic Group, Limited, the Solartron automatic X-ray spectrometer XZ-1030, which is stated to provide a new, rapid, and accurate method of material analysis, was demonstrated on Monday at Stornoway House, the London headquarters of the Firth Cleveland, Limited, group, of which Solartron is a subsidiary. The equipment, which detects and determines all elements of greater atomic number than 12, is said to have extreme accuracy on major constituents while remaining fully capable of analysing alloying constituents and impurities where considerable sensitivity is required.

Copper based alloys provide an ideal example of the instrument's capabilities, it is stated—a complex brass containing copper, zinc, lead, nickel manganese, iron, and aluminium can be analysed in a few minutes. Accuracies exceeding routine chemical work can be obtained and a precision of better than 0.1 per cent. for the main copper determination, it is claimed.

High alloy steels, often containing a multitude of elements, can be "rapidly determined with an accuracy on the nickels and chromium determination which surpasses other methods." The instrument, as well as being fully automatic, is entirely flexible and is capable of performing not only routine analysis but also fulfilling research requirements.

In order to provide a service and to deal with inquiries and samples for analysis, a London applications laboratory has been set up by Solartron and is in operation.

New Wire Rope Depot for Martin, Black

AS part of policy of speedy delivery from stock, Martin, Black & Company (Wire Ropes), Limited, Coatbridge, near Glasgow, has now opened a wire rope depot at 4, Stockbridge, Manor Chare, Newcastle-upon-Tyne. The North-eastern area office, under the management of Mr. A. R. Jenkin, has also moved to the new address, but retained the previous telephone number (Newcastle 2-1282) and Telex number (53362).

A large variety of ropes for the north-east's diverse industries are held in stock at the new depot, where splicing facilities are also available.

JOHNSON, MATTHEY & COMPANY, LIMITED—Mr. H. R. Brooker has been appointed a director and a joint managing director.

Coalfield News

East Midlands Output May be European Record

PRODUCTION at collieries in the East Midlands Divisional Coal Board during the week ended June 10 was the highest ever recorded in the division and possibly in the UK. Miners hope also that they have set what will prove to be a European record. During the week, output per manshift at the coal face was 129.5 cwt. which represents an output of 44.5 cwt. for every person employed by the division.

Announcing the figures last weekend, Mr. W. L. Miron, chairman of the division, said: "We have every reason to think that this may be a European record, but cannot yet make a definite claim since the Soviet figures are not known to us."

He was speaking at the opening of the Leicestershire and South Derbyshire Mineworkers' Gala at Coleorton, near Coalville. It was hoped that as a result of the gala £1,000 would be raised for the Mineworkers' Paraplegic Fund.

WHITEHILL COLLIERY, Rosewell (Midlothian), is to close down today (Friday). Only a few men will be left to deal with salvage. About 260 men will be transferred to other pits, mostly to Bilston Glen Colliery.

PIT ELECTRICIAN Mr. Eric Varley (29), of Poolsbrook, has been chosen by the Derbyshire Area council of the National Union of Mineworkers as its nominee to succeed Sir George Benson as Labour MP for Chesterfield, who is to retire.

PRODUCTION AT THE Maritime Colliery, Maesycoed (Glam), the shaft of which is believed to be the first sunk in Pontypridd, ceased on June 23. About 340 miners employed at the colliery have been offered work at other pits in the district.

MORE THAN 100 miners who went on strike four days previous at Cossall Colliery (Notts), returned to work on Monday. The strikers claimed they lost money when they were transferred from one coalface to another. They are to negotiate with the Coal Board.

SHIPMENTS OF COAL and coke from the South Wales ports last week reached 62,801 tons, the highest figure for over a month. The previous highest shipment was 67,817 tons in the week ended May 21. The total was an increase of 9,045 tons on the week before, and 9,167 tons above the corresponding period of 1960.

OVERALL productivity in the Durham Division of the NCB last week reached 23.45 cwt. per manshift, compared with 22.42 cwt. in the same week of last year. At the face, productivity was 66.54 (65.3) cwt. per manshift. In the first 24 weeks of the year, overall productivity averaged 23.2 (22.11) cwt. per manshift.

SURFACE MANAGER at Seaton Burn Colliery (Northumberland), Mr. George Chamberlain is retiring after working for 52 years at the colliery. He started in the pit at 13 and was a weighman for 22 years until 1951. Also retiring is Mr. William Thompson, overman, who has worked for 52 years in North-east pits.

KEY ELECTRICIANS and mechanics involved in last week's unofficial stoppage which affected 36 out of the 43 pits in Lancashire, returned to work on Monday. The 1,200 craftsmen whose three-day "organized absenteeism" was a protest against the delay in settling their £5 a week pay claim, were joined on Thursday of last week by sympathy strikers at Barrow Colliery, Barnsley, and at the No. 5 Area Central Workshops, Birkwell. About 460 men were affected.

AT THE WATH-ON-DEARNE (Yorks) inquest on Mr. George Pendlebury (31), a miner, who threw himself down the 2,000-ft. shaft at Manvers Main Colliery, the Sheffield assistant deputy coroner, Dr. H. H. Pilling, recorded a verdict of Suicide, there being no evidence to show Pendlebury's state of mind at the time.

BECAUSE OF POOR working conditions which have made production uneconomical, the Northern (N&C) Divisional Coal Board has decided to close part of Woodhorn Colliery, Ashington (Northumberland). The 300 affected are to be transferred to other pits in the neighbourhood after the annual holiday period in July.

AWARD FOR COURSES at Outward Bound Sea Schools have been received by Edward Walsh (19), apprentice electrician at North Walbottle Colliery, Newcastle-on-Tyne, and Alan Smith (15), trainee at Crofton Mill, near Blyth (Northumberland), from the Northern (N&C) Divisional Coal Board. A third award, for the North Northumberland Area, is still to be made.

WEST FIFE miner, Mr. David Clark Bruce (51), died of shock and not from his injuries when he was trapped for 15 minutes by a roof fall underground at Mary Colliery, Lochore, in April, said Dr. James Begg, who carried out a post-mortem, at an inquiry at Dunfermline last week. "The injuries were insufficient to cause death," he said. The jury returned a formal verdict.

MINERS AT Cortonwood Colliery, near Barnsley, have set up a committee to raise money for the widows of the four men killed at the pit last week. Letters are being sent to the 109 pits in the Yorkshire coalfield and an appeal made to the chairman of Wombwell Urban Council, Cllr. Joe Rose, who is also secretary of the Cortonwood NUM branch. Rotherham Rural District Council is supporting the appeal.

AREA COMMISSIONER for the south-east area, West Riding of Yorkshire of the St. John Ambulance Brigade, Mr. Edward Soar is to retire at the end of next month after 35 years' service with the Brigade. He has spent more than 50 years in the coal mining industry and his work has ranged from mines surveying underground to his present department, the supplies section, Group A, No. 3 Area, North-Eastern Divisional Coal Board.

Revaluation Threat to Scots Miners' Welfare Clubs

REVALUATION of miners' welfare clubs in Scotland would force some to close down, said Mr. Abe Moffat in his farewell address in Edinburgh last Friday as chairman of the Scottish divisional welfare committee of the Coal Industry Social Welfare Organisation. Mr. Moffat, who is also retiring as president of the Scottish Area of the National Union of Mineworkers in September, said that expert advice was being taken in the preparation of appeals.

"In the home localities we should follow this up by raising the question with local councils and Members of Parliament," he said. "It will be criminal if institutes are compelled to close down due to this pernicious piece of legislation."

Mr. Moffat, who started in the pits at 14, received a number of presentations, including an honorary membership card, on his retirement from the chairmanship, from Mr. L. R. Milligan, deputy chairman of the Scottish Divisional Coal Board.

THE COAL TRADE

APART from the more popular best quality descriptions, the call for which remains fairly steady, trade has sagged to the usual seasonal low so far as house coal is concerned. It would appear that there is some consumer stocking of best and hand-picked coals taking place, but in a number of districts merchants are by no means fully stocked up. Although the demand for premium smokeless fuels has fallen off, there cannot be all that much improvement in delivery as merchants are still finding it difficult to get their requirements quickly and most of the deliveries are earmarked before they reach the depots.

LEICESTERSHIRE

Supplies of all grades of house coal, apart from best qualities, are available and rail despatches prompt. Orders from consumers continue to be placed at an average rate for the time of the year, but continue to be mostly for nominated qualities. Anthracite tonnages are still insufficient to meet the demands placed upon distributors for the usual qualities. Supplies under the Small Anthracite Supply Scheme show no improvement and lengthy order lists are now the rule rather than the exception.

The supply of Phurnacite also shows no improvement and orders are accumulating for this quality. As it is now two months since the start of summer prices and supplies of these fuels show little improvement, distributors are receiving inquiries for alternatives. The new premium smokeless fuels retain popularity but, here again, the poor supply situation generally is handicapping the trade.

The central heating market as regards coke is at an exceptionally low ebb. There are few orders about this year to take advantage of summer prices, apart from service orders and some activity from local authorities. Supplies of all grades are plentiful. A feature of the present position is that considerable stocks are accumulating at producing points.

The industrial coal market remains firm with supplies well up to standard.

NCB "The Country's Biggest Buyers"

SPENDING in the region of £250,000,000 a year, the National Coal Board was the biggest buyer in the UK, declared Mr. Alfred Robens, chairman of the board, on Tuesday. Accompanied by Mr. J. Murray Grammer, director-general, purchasing and stores, he was making a tour of the Ashchurch (Glos) works of Dowty Mining Equipment, Limited.

Orders worth millions of pounds might result from the extensive reorganization and mechanization of the country's coal mines, he believed, and added that the industry had a forthright development programme, but without the supplier they could not make the progress that competition demanded. Mr. Robens went on: "My own view about a company such as this is that we want to work in partnership with them in the sense that we express fully the policy we have in mind. In return the board would receive from the company the best technical advice and knowledge of the machinery it purchased." He continued: "Our orders here run into several millions a year, and I can see this continuing as long as there is a progressive and large coal mining industry."

Holidays Affect Coal Output

EXCEPT for production which is now feeling the effects of colliery holidays, things are fairly static in the coal industry. Production last week dropped just over 150,000 tons to 3,755,000 tons, but consumption at 3,438,000 tons for week ended June 17 was 4,000 tons up on the previous week. Consumers' stocks rose slightly to 14,156,000 (13,762,000) tons — the increase affecting all sectors—and undistributed stocks showed little change at 23,193,000 tons.

There were 570,180 wage-earners on colliery books on June 17, against 601,140 on June 18, 1960, the numbers engaged at the coal face being 213,710 and 229,330 respectively. Total absenteeism (all workers) in the week ended June 17 was 14.31 per cent., compared with 13.62 per cent. in the week ended June 18, 1960. Output at the face was 4.173 tons and overall 1.458 tons in the week ended June 17, compared with 3.953 and 1.405 tons in the week ended June 18, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended June 24, and the tonnage lost through disputes:—

Division.	Week ended June 24, 1961.		Week ended June 25, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish ..	359,000	8,000	361,000
Northern (NAC) ..	195,000	51,000	217,000
Durham	458,000	—	465,000
North-Eastern ..	791,000	48,000	785,000
North-Western ..	232,000	3,000	250,000
East Midlands ..	819,000	75,000	848,000
West Midlands ..	277,000	1,000	277,000
South-Western ..	376,000	9,000	397,000
South-Eastern ..	25,000	1,000	30,000
Great Britain—			
Deep-mined coal ..	3,532,000	196,000	3,630,000
Open-cast coal ..	181,000	—	157,000
Other deep-mined (including licensed mines) ..	42,000	—	46,000
TOTAL ..	3,755,000	196,000	3,833,000

THOMAS MARSHALL & COMPANY (LOXLEY), LIMITED, manufacturers of fireclay refractories—Arrangements are in hand for an issue of £250,000 6½ per cent. debenture stock, 1981/86, which will be placed privately and no Stock Exchange quotation will be applied for. As part of the operation it is intended to repay the existing 6 per cent. first mortgage debenture stock, of which £79,908 is currently outstanding, so that the issue will result in the company receiving a net sum of approximately £150,000. This will be used to finance a programme of capital expenditure.

News in Brief

CHAIRMAN OF THE Firth Cleveland, Limited, group, Mr. Charles W. Hayward announced at a meeting in London on Wednesday the sale to Fram, Canada, Limited, of the filter division of the susbidiary, Simmonds Aerocessories, Limited.

A £50,000 PLANT is to be built by the British Oxygen Company, Limited, at its Middlesbrough works which will increase by 50 per cent. the production capacity of nitrogen supplies to the Wilton division of Imperial Chemical Industries, Limited.

PERMISSIBLE stresses have been revised by the Ministry of Transport to permit the use of cold-worked steel in bridgeworks at stresses appropriately higher than those for mild steel. The revisions follow appoaches to the Ministry by the Reinforced Concrete Association and others.

TO MANUFACTURE THE roller gear drive and other Ferguson products, with selling rights in the Common Market countries, Austria, Switzerland, Spain, Portugal, and Scandinavia, the Ferguson Machine Company of Belgium has been formed with a capital of 10,000,000 Belgian fcs. (about £71,900).

THE LEICESTER machine tool firm of Adcock & Shipley, Limited, has installed a hydraulic crane on one of its six ton lorries so that customers with small factories and without the necessary handling equipment are not handicapped when taking delivery of machines from the company.

ONE MAN died from burns and four others were seriously ill on Wednesday after a slag ladle exploded at the Ebbw Vale steel plant of Richard Thomas & Baldwins, Limited. Molten metal showered across a number of men, nine of whom were taken to hospital, while three others were treated in the works.

SOME DISLOCATION in the supply of long-length moulded and braided hose will result from the fire last week at the works of British Moulded Hose Company, Limited, Watford, a subsidiary of BTR Industries, Limited, the company announces. Every effort is being made to restart manufacture as soon as possible.

CHINESE COAL production last year reached a total of 425,000,000 metric tons compared with 347,800,000 tons in 1959 and 272,000,000 tons in 1958, according to a Russian source. Output of pig-iron rose from 20,500,000 tons in 1959 to 27,500,000 tons in 1960, and that of raw steel from 13,300,000 tons in 1959 to 18,500,000 tons last year.

ACCORDING TO provisional figures issued last week by the Ministry of Labour, the number of unemployed in the UK this month is fewer than at any time since August, 1957, while the number of unfilled vacancies notified to the employment exchanges is higher than it has been since July, 1956, and nearly 50 per cent. greater than the number of unemployed.

A NEW LEEDS BRANCH of Alfred Herbert, Limited, machine-tool and equipment manufacturers, of Coventry, is to be opened on Monday. It will provide an engineering service in Yorkshire (apart from the western fringes), Northumberland, Cumberland, Westmorland, Durham, part of Lancashire, large areas of Lincolnshire and Nottinghamshire, and north-east Derbyshire.

WHEN BRITAIN'S largest tanker, the 65,000-ton d.w. Serenia, goes on trials at the end of this month, technicians on board will include members of the staff of the British Shipbuilding Research Association. Vickers-Armstrongs (Shipbuildings), Limited, which constructed the ship has arranged an extensive programme of measurements to be undertaken by its staff and by BSRA.

WINNERS OF the J.C.B. Cup presented annually by J. C. Bamford (Excavators), Limited, for competition among home distributors of its earth moving equipment, were this year the distributors for Northern Ireland, Northern Plant & Machinery Company, Limited, Finaghy, Belfast. The award is made to the distributor obtaining the best market penetration in the 12-month period.

LAST MEETING of the International Tin Council, under the present five-year agreement, was held in London on Wednesday when formal steps were taken to bring the first tin agreement to an end. An interim committee met on Thursday to complete the process for bringing the second argeement into force, and on Monday the inaugural meeting of the new Tin Council will be held.

SEVERELY affected by the slump in motor sales and the building industry, further dismissals in the Australian steel industry were announced last week. It is reported that John Lysaght (Australia) Pty., Limited, is to give notice to 300 more employees at the Port Kembla plant, where, last month, 350 were dismissed; 500 were also dismissed last month at the company's Newcastle (NSW) works.

DIESEL ENGINE MANUFACTURERS of Peterborough, F. Perkins, Limited, a subsidiary of Massey-Ferguson, (Holdings) Limited, has signed an agreement to manufacture the N.S.U. Wankel G. rotary engine under licence in the UK. The agreement, which enables Perkins to manufacture petrol marine motors and diesel motors is with the patent holders N.S.U. Motorenwerke, AG, and Wankel, GmbH, both of West Germany.

COURSE ON the latest developments in solid fuel firing equipment held recently at Manchester by the National Industrial Fuel Efficiency Service is being repeated. The new course will be from Mondays to Fridays starting on October 2, December 4, February 5, and April 2. The course fee is £12 12s. (excluding hotel accommodation). Further information can be obtained from NIFES, 71, Grosvenor Street, London, W.1. (Telephone: HYDe Park 9706).

Higher Group Profit for F. H. Lloyd

INCREASE in the group profit for the 52 weeks ended April 1, 1961, to £975,236 from £682,739 for the previous 53 weeks' period, is reported by the directors of F. H. Lloyd & Company, Limited, steel-founders, of Wednesbury (Staffs). The dividend is being raised by 6d. to 3s. per £1 share, with a final of 2s. 6d. and a one-for-four rights issue of 450,000 ordinary shares at 45s. per share to holders registered June 28 is to be made. Net profit for the period is up from £401,400 to £480,409, after considerably increased taxation of £494,827 (£281,339).

The directors state that since the end of the financial year results show a further improvement and the order-book is being maintained.

ENGLISH ELECTRIC COMPANY, LIMITED—In the formal offer for the capital of W. H. Dorman & Company, Limited, manufacturing engineers, makers of diesel engines and generating sets, etc., of Stafford, it is stated that English Electric expects to pay an unchanged 3 per cent. interim for 1961, and, barring unforeseen circumstances, to maintain the final, which will be payable on capital as increased under the offer terms at last year's 7 per cent. rate.

In Parliament

OIL FROM COAL

Idea Dropped as Uneconomic in Britain

REPORT and findings of the Wilson Committee on coal derivatives, including its view that the prospects of making oil from coal economically in Britain are so remote that no further technological work on the development of this process should be undertaken at present, has been accepted by the Minister of Power, Mr. Richard Wood. MR. WOOD said that in agreement with the Gas Council and the National Coal Board, he was also accepting the committee's other recommendations.

The Minister said in a written reply to Mr. Gerald Nabarro (Con.), that he had arranged for his Department, which had been carrying out research and development on the slagging gasification of coal as a means of providing the raw material for oil synthesis, to continue work until March 31 next year, when the Gas Council would become responsible for all such work.

He stated: "The Wilson Committee was asked to make recommendations about the direction of further research and development work on promising processes for making gas, oil and chemicals from coal, and the type of organization or organizations best suited to carry out such work."

Other Findings Accepted

Mr. Wood accepted the committee's view that, in this field town gas offered the greatest scope for expansion, but that to make this possible new plants would have to make gas more cheaply than existing ones. He had therefore decided, in agreement with the Gas Council and the National Coal Board, to accept the committee's recommendations that the development of high-pressure slagging gasifiers should be pursued, and that the Gas Council should be responsible for further work on the standard Lurgi gasifier, using British coals; on the Otto-Rummel gasifier, and on any further gasifiers suitable for town gas.

The Gas Council should be responsible for development work on slagging gasifiers, and the National Coal Board should be responsible for work on producer gas plants.

The Department of Scientific and Industrial Research had consequently stopped its development work on this process, but in accordance with the committee's recommendations it was continuing basic studies on catalysis, and was keeping in touch with developments in making oil from coal.

The Gas Council and the National Coal Board, he added, were making a joint economic study of the possibilities of the Lurgi process which might later be extended to include slagging gasification. This study would help to define the scope for further development of the process.

ENERGY CONSUMPTION

ASKED by MR. GEORGE LAWSON (Lab.), the rise in total energy consumption in the UK in 1960 compared with 1959, and the percentage increase in each of the main energy constituents, coal, oil, gas, and electricity, MR. RICHARD WOOD, Minister of Power, said total inland energy consumption in the UK was 264,000,000 tons of coal equivalent in 1960, compared with 245,000,000 of coal equivalent in 1959. The respective increases in the use of coal, oil, gas and electricity were 4, 17, 4, and 13 per cent.

Total energy consumption in Scotland was 25,000,000 tons of coal equivalent in 1960, and 23,000,000 tons in 1959. Respective increases in the use of coal, oil, gas, and electricity were 6, 14, 2, and 11 per cent.

Coal Chartering

ALTHOUGH fair-to-moderate business is still being concluded with coal from Hampton Roads to Japan, the market is not so steady and owners have found it impossible in certain circumstances to maintain the last basis of rates paid.

Recently $10.40 was paid Roads/Japan for 14,000 tons for July and 12,000 tons secured $10.50 for August/September but there are now reports of Roads/Kawasaki 13,000 tonner for August 10/25 at $9.10, similar rate to Japan for 20,000 tons August 10/31 and $9.25 for 19,000 tons to Tokyo-Muroran Range August 20/September 10. There are also reports of tonnage being fixed to Yugoslavia at $5.35 for early loading, and for July apparently $4.15 has been paid to West Italy. On the other hand Hampton Roads/Rio paid $6.75 for 9,500 tons late June/July 7 and 9,000 tons was recently fixed to Montevideo for June 28/ July 10 at $7.95.

South African chartering reports Durban/Kawasaki or Osaka, 12,500 tons anthracite, 62s. 6d. one discharge, 65s. both, f.i.o. and trimmed, for July 15/August 5, and Durban/Rangoon, 9,500 tons for July 24/August 21, and 8,800 tons August 2/September 2 both at 53s. f.i.o. and trimmed. Lourenço Marques/Capetown paid 19s. f.i.o. and trimmed for 10,000 tonner for four consecutive voyages commencing July 10/18.

The outward coal trade from the UK to Mediterranean is quiet but, nevertheless, there is some inquiry. On the other hand, nothing appears to be quoted for West Africa. There is still a moderate demand in the coasting section with quite a fair interest from East Coast to Scandinavia.

LT.-COL. L. R. F. FELL is to retire as full-time consultant on railway traction to Rolls-Royce, Limited.

Exports of British Coal

DETAILS of British coal exports and bunker coal shipments in May, and the totals for the first five months of this year and last, are given below.

	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
Categories.	Tons.	Tons.	Tons.
Anthracite—			
Large	6,687	30,800	29,754
Graded	29,250	96,107	100,809
Cleaned smalls	11,741	94,242	94,985
All other	43,703	120,300	169,306
Steam coal (including household)—			
Large	49,658	301,333	243,854
Graded	27,035	182,270	116,995
Cleaned smalls	159,921	490,021	546,493
Untreated smalls	135,953	453,006	588,615
Other	9,538	82,456	65,676
Gas coal—			
Unscreened	6,434	100,880	50,560
Graded	48,050	176,816	156,945
All other	2,680	23,069	13,834
Coking coals	38,990	63,795	83,354
TOTAL	569,640	2,215,095	2,261,180
Destinations.			
Canada	9,391	20,846	13,618
Other Commonwealth countries	1	13,716	4,950
Eire	134,484	538,249	522,102
Finland	14,734	14,580	31,491
Sweden	39,158	76,228	87,520
Norway	10,208	48,655	46,313
Denmark	97,870	686,363	481,567
Western Germany	55,657	183,565	222,195
Netherlands	144,223	345,737	475,775
Belgium	27,885	65,951	98,074
France	24,878	75,537	122,875
Portugal	4,760	70,240	75,942
Italy	5,346	51,834	56,892
Other foreign countries	1,045	23,594	21,866
Fuel taken on board vessels engaged in the foreign trade (including fishing vessels) for their own use—			
British flag	6,682	180,846	39,511
Other flags	2,323	17,300	13,016

Exports of Coke and Patent Fuel

THE following table gives figures of exports of coke and manufactured fuels from the United Kingdom during May, and the totals for the first five months of this year and last.

Products.	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Gas coke	37,613	242,851	263,742
Hard coke	34,475	194,406	134,286
Breeze	38,450	167,342	142,707
Manufactured fuel	8,188	51,783	34,715
TOTAL	118,726	655,382	575,450

CHECKWEIGHMAN at the Leeds works of Yorkshire Imperial Metals, Limited, Mr. L. Haigh was presented by Mr. C. G. Robinson, personnel manager, with the 500th gold watch awarded by the firm in recognition of 25 years' service.

Imports and Exports of Mining Machinery

ACCORDING to Board of Trade returns, mining machinery (other than portable power tools) valued at £226,124 was imported during May, compared with £83,118 in May, 1960. Imports for the first five months of the year were valued at £762,764 against £439,550 in the corresponding period of 1960.

The appended table contains figures of export values of mining and well-drilling machinery in May and values for the first five months of this year and last.

Destination.	Month ended May 31.	F emonths ended May 31.	
	1961.	1960.	1961.
	£	£	£
Union of South Africa	69,231	257,638	283,079
India	101,653	524,645	410,585
Australia	26,428	181,833	150,694
Canada	28,041	172,952	185,073
Trinidad	14,399	188,297	64,467
Other Commonwealth countries and Eire	85,339	586,548	659,020
Argentina	12,157	307,583	22,148
Other foreign countries	131,427	1,162,804	1,303,518
TOTALS			
Well-drilling machinery—			
Petroleum	99,203	1,216,912	813,151
Other	24,155	169,906	211,649
Mining machinery (excluding portable power tools)—			
Coal-cutters, power operated—			
Complete	25,676	208,402	218,080
Parts	66,088	364,833	346,608
Conveyors, underground—			
Complete and parts	73,597	538,935	432,682
Winders, power operated	37,936	208,219	289,272
All other	142,020	675,093	767,142
TOTAL	468,675	3,382,300	3,078,584

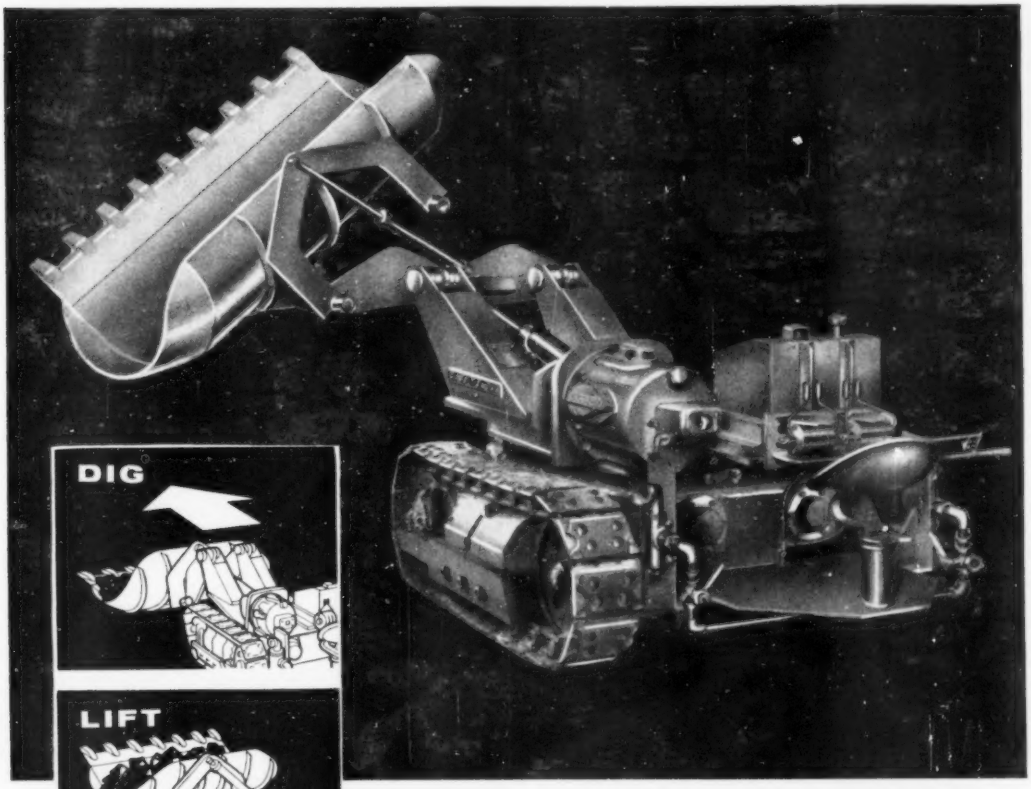
Rise in Coal Exports if UK Joins Common Market

IF Britain joined the Common Market he would expect coal exports to reach 10,000,000 tons a year by 1965, Mr. Alfred Robens, chairman of the National Coal Board, said shortly before leaving for Paris for talks with French coal industry officials last week.

This, he said, would mean an increase of about £20,000,000 in foreign currency. "At present we are hitting the ceiling of export quotas in Europe. To join the Common Market would be a good thing for Britain's coal industry. There would be a free flow and we would sell more."

On his return from France, Mr. Robens said that the way was now open for further discussions on boosting Britain's coal exports to France. He hoped a French mission would visit Britain in the autumn to discuss coal orders. During his stay he met officials of the French Government, the state-owned coal industry, and coal importers, and he was "very pleased" with the talks that had taken place.

BUSINESS AT the 32nd Exide Convention held last week by Chloride Batteries, Limited, at Scarborough (Yorks), was devoted to the sales policy of the company. The group managers' conference which followed was attended by the general managers of all the oversea companies in the Chloride group.



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Operated either by compressed air or flameproof electric motors, the 623 Side Dump Loader with smooth hydraulic power digs, lifts and discharges sideways onto scraper or belt conveyor.

The big 21 cu. ft. Bucket lifts 2 tons and tips up to 50° to discharge. Front discharge bucket and other materials handling attachments make this machine even more versatile.

Backed by Eimco's years of experience in mining the new 623 Side Dump Loader is the answer to low cost face mechanisation.

P6439

Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in May are given in the following tables, based on the Board of Trade returns, and including totals for the first five months of 1960 and 1961.

Total Exports of Iron and Steel

Destination.	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Malta	415	2,678	2,570
Sierra Leone	590	2,048	5,026
Ghana	1,622	8,318	8,230
Nigeria	6,826	25,235	34,685
Union of South Africa	4,923	30,646	28,065
South-West Africa	1,109	3,582	7,173
Rhodesia and Nyasaland	1,915	9,240	15,889
Tanganyika	2,399	5,005	11,770
Kenya	2,318	11,301	17,511
Uganda	86	610	2,108
Mauritius	256	1,867	1,119
Bahrein, Qatar, and Trucial States	2,532	7,556	9,345
Kuwait	2,896	3,121	10,336
India	12,148	102,439	90,699
Pakistan	14,892	30,122	31,621
Singapore	4,027	8,111	13,046
Malaya	1,816	8,297	12,440
Ceylon	5,289	26,042	19,426
British North Borneo	31	2,178	1,125
Hongkong	8,347	29,349	31,124
Australia	10,098	71,608	75,326
New Zealand	24,016	41,761	128,670
Canada	18,130	106,734	60,358
Jamaica	1,480	11,152	7,765
Trinidad	4,392	19,493	17,998
British Guiana	557	3,735	4,272
Other Commonwealth countries	2,278	11,851	11,526
Eire	5,536	26,464	32,063
Soviet Union	1,860	13,458	10,553
Finland	7,476	18,601	25,555
Sweden	12,736	86,814	76,231
Norway	15,016	56,349	57,171
Denmark	5,493	45,192	36,883
Poland	3,551	5,329	10,812
Western Germany	10,833	70,465	41,886
Eastern Germany	2,093	12,247	10,489
Netherlands	17,988	56,235	61,472
Belgium	3,939	16,743	13,266
France	2,343	2,979	5,785
Switzerland	3,070	5,458	10,191
Portugal	2,713	6,723	11,087
Spain	2,409	20,475	10,219
Italy	6,542	19,091	28,790
Austria	416	2,255	2,347
Yugoslavia	2,553	20,673	18,638
Greece	2,185	7,494	14,614
Turkey	1,725	5,048	8,343
Netherlands Antilles	52	2,094	285
Portuguese East Africa	381	1,774	1,368
Egypt	3,389	6,464	16,847
Libya	998	2,923	4,348
Sudan	922	4,699	3,857
Israel	2,070	9,206	9,666
Saudi Arabia	242	196	710
Iraq	1,411	10,485	21,274
Iran	2,724	31,604	12,353
Burma	436	3,848	2,261
Thailand	337	3,046	2,569
Indonesia	185	14,179	2,559
China	574	26,046	9,725
Japan	10,642	35,100	53,143
Philippine Republic	697	4,534	1,874
USA	18,949	132,695	54,624
Cuba	84	5,121	775
Mexico	472	3,384	2,126
Columbia	615	3,643	5,404
Venezuela	2,227	21,239	10,123
Ecuador	333	1,519	1,445
Peru	588	3,198	3,869
Chile	532	1,274	1,805
Brazil	4,015	8,460	8,534
Uruguay	323	4,670	4,194
Argentina	18,708	43,524	68,731
Other foreign countries	7,509	30,312	30,564
TOTAL	327,280	1,497,409	1,482,751

Total Imports of Iron and Steel

From	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Union of South Africa	4,706	16,050	17,122
Rhodesia and Nyasaland	847	3,028	16,781
Canada	5,110	27,872	57,967
Other Commonwealth countries and Eire	2,168	11,475	14,191
Soviet Union	769	14,027	9,339
Sweden	5,381	20,026	23,401
Norway	11,209	62,628	49,309
Poland	70	7,563	562
Western Germany	1,753	68,680	14,946
Netherlands	8,220	92,894	49,102
Belgium	2,277	49,758	21,643
Luxembourg	375	6,756	10,019
France	1,299	29,256	10,482
Italy	20	13,734	250
Austria	492	5,479	2,625
Japan	428	3,137	3,189
USA	985	88,766	6,747
Other foreign countries	1,485	30,410	6,070
TOTAL	47,594	551,539	313,745
Iron and steel scrap and waste fit only for the recovery of metal	1,708	66,484	9,720

Exports of Iron and Steel by Product

Product.	Month ended May 31.	Five months ended May 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Pig-iron	9,854	83,953	41,392
Ferro-columbium (niobium)	2	60	19
Ferro-tungsten	88	467	442
Other ferro-alloys	345	5,241	1,608
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	14,242	19,571	38,829
Pieces roughly shaped by forging	179	741	1,079
Iron bars, rods, angles, shapes, and sections	112	642	955
Steel bars, rods, angles, sections, and shapes	7,520	23,735	34,857
Iron plates and sheets	6	409	494
Universal plates	2,543	9,497	7,660
Steel plate, 3 mm. and under 4.5 mm. thickness	2,963	16,540	15,793
Ditto, 4.5 mm. or more in thickness	35,697	149,495	145,998
Blacksheets and blackplate	35,920	132,522	160,511
Hoop and plate	9,371	41,770	54,909
Tinplate	42,660	239,514	189,615
Decorated tinplate	924	2,024	3,161
Galvanized sheets	6,314	33,826	31,596
Other (incl. tinned sheets, terneplate, and terneshects)	3,625	13,469	17,668
Railway and tramway construction material	19,686	58,824	97,906
Wire rods of steel (incl. alloy steel)	8,825	26,038	27,221
Wire	11,180	55,135	58,020
Tubes, pipes, and fittings	59,979	333,118	283,934
TOTAL	327,280	1,497,409	1,482,751

TENDERS FOR RAILWAY wagons to the value of £2,750,000 are being invited from oversea manufacturers by the New Zealand Government. The Railways Minister, Mr. J. McAlpine, said last week that the tenders would be sought for 1,300 wagons and added that local workshops are fully employed on existing orders and on the maintenance of existing stock. He said that the wagons are needed urgently to replace obsolete stock.

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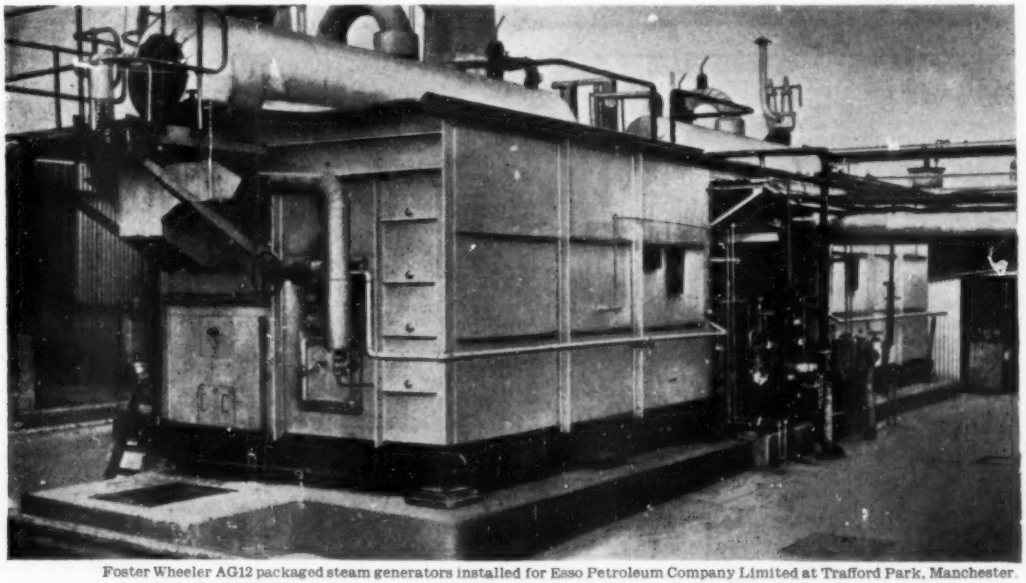

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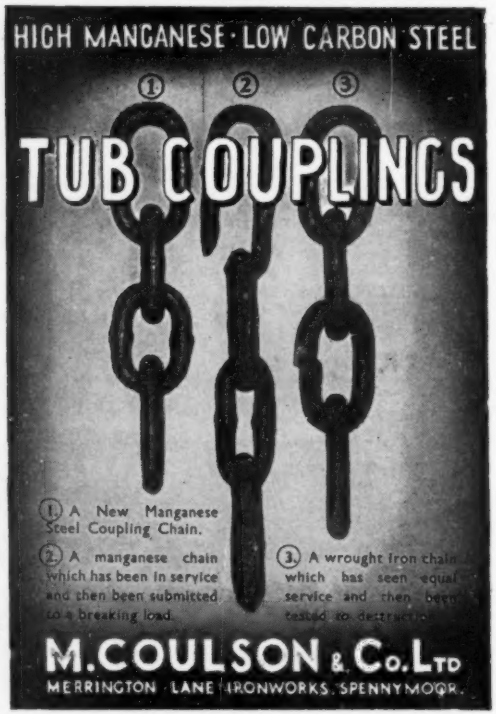

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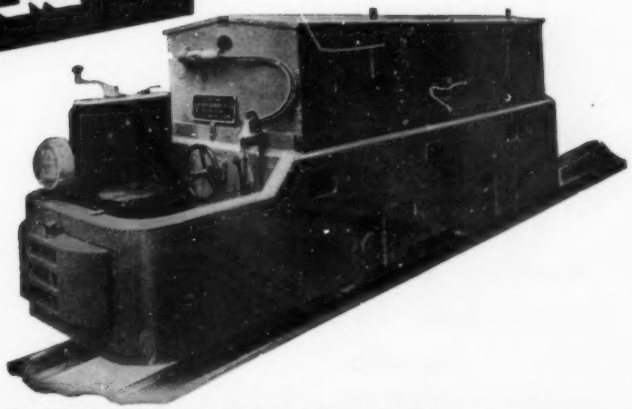

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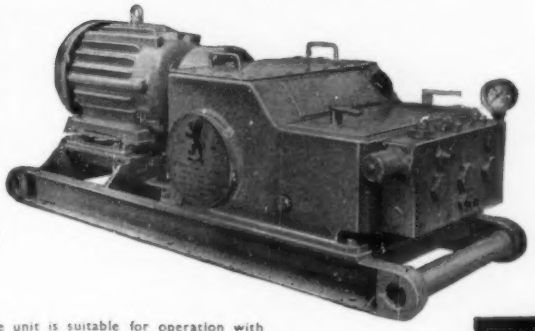

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INDEX TO ADVERTISERS—*continued from page 60.*

Jenkins, W. J. & Co. Ltd. .. —
Johnson Rolls Ltd. 19
Jones, W. Stanley (Engineers) Ltd. .. .. —
Joy, Sullivan Ltd. .. .. —

Kennedy, Allan & Co. Ltd. .. —
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Lever, J. & Sons Ltd. .. —
Lilleshall Co. Ltd. .. .. —
Lindley, H. Ltd. 4
Locker Industries Ltd. .. —
Lodge-Cottrell Ltd. .. —
Lumb, Jas. & Sons Ltd. .. —
Lysaght's, Scunthorpe Works 37

Mackley, E. N. & Co. Ltd. .. —
M. & C. Switchgear Ltd. .. —
Markham & Co. Ltd. .. .. —
Marley, Wilfred, Ltd. .. .. —
Marshall, Thos. & Co. (Loxley) Ltd. .. .. .. —
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Massey, B. & S. Ltd. .. .. —
Mastabar Mining Equipment Co. Ltd. .. .. .. —
Mather & Platt Ltd. .. .. —
Matthews & Yates Ltd. .. —
Mavor & Coulson Ltd. .. 3
McClure, David Ltd. .. .. —
Merer Ltd. .. .. .. —
Mellowes & Co. Ltd. .. .. —
Metalectric Furnaces Ltd. .. —
Michael & Partners Ltd. .. —
Midgley & Son Ltd. .. .. —
Millom Hematite Ore & Iron Co. Ltd. .. .. .. —
Mills, James Exors. of .. —
Mine Safety Appliances Co. Ltd. .. .. .. —
Mining Engineering Co. Ltd. .. 31
Mitchell Ropeways Ltd. .. 56
Mobil Oil Co. Ltd. .. .. —
Mobile Lifting Services Ltd. .. —
Moler Products Ltd. .. .. —
Mond Nickel Co. Ltd. .. .. —
"Monitor" Patent Safety Devices Ltd. .. .. —
Mono Pumps Ltd. .. .. —
Moorwood, John M. Ltd. .. —
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Morris, Robert Ld. .. .. —
Mowlem-Centraline .. .. —
Murex Welding Processes Ltd. —
Muschamp, N. J. & Co. Ltd. —

National Boiler & General Insurance Co. Ltd. 50
National Coal Board .. —
National Industrial Fuel Efficiency Service .. .. —
Neal, R. H. & Co. Ltd. .. —
Needham Bros. & Brown Ltd. —
Nelson, W. & H. Ltd. .. —
New Conveyor Co. Ltd. .. —
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Niagara Screens & Plant Ltd. —
Nife Batteries .. .. .. —
Nordberg Manufacturing Co. Ltd. .. .. .. —
North British Rubber Co. Ltd. —
North Eastern Marine Engineering Co. Ltd. 47
Northfield Industrial Fabrications Ltd. .. .. —
Norton Harty Engineering Co. Ltd. 16
Norton, Sir James Farmer & Co. Ltd. .. .. .. —
Nortons Tividale Ld. .. —

Oldham & Son Ltd. 2
Ormerod, Edward & Co. Ltd. —
Osborn, S. & Co. Ltd. .. —
Oughtibridge Silica Firebrick Co. Ltd. 42

Padley & Venables Ld. .. —
Parkes, Timothy, & Sons Ltd. —
Parramore, F. & Sons Ld. .. —
Parsons, C. A. & Co. Ld. .. —
Parsons Chain Co. Ltd. .. —
Parsons Marine Turbine Co. Ltd. 47
Patterson Lamps (1953) Ld. —
Peebles, Bruce, & Co. Ld. 38 & 39
Pegson Ltd. .. .. .. —
Permutit Co. Ltd. .. .. —
P.G. Engineering Ltd. .. —
Pickford, Holland & Co. Ld. —
Pittrail Ld. .. .. .. —
Power-Gas Corporation Ld. .. 41
Power Gas Economy Co. .. —
Power Plant Co. Ld. .. —
Premier Cooler & Engineering Co. Ld. .. .. .. —
Press, Wm. & Son Ld. .. —
Price, J. T. & Co. Ld. .. —
Priest Furnaces Ld. .. .. —
Procter Bros. (Wireworks) Ld. —
Protector Lamp & Lighting Co. Ld. .. .. .. —
Pulsometer Eng. Co. Ld. .. 49

Qualter Hall & Co. Ld. .. —

Railway & General Engineering Co. Ld. .. .. —
Raine & Co. Ld. 51
Ransomes & Marles Bearing Co. Ld. 61
Rapid Magnetic Ld. .. .. —
Rawlplug Co. Ld. .. .. —
Reaveli & Co. Ld. .. .. —
Reay Brass Foundry Co. Ld. —
Reid Gear Co. Ld. .. .. —
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Renold Chains, Ld. .. .. —
Reside, Jas. Ld. .. .. —
Revolvo Ld. .. .. .. —
Reyrolle, A. & Co. Ld. .. 7
Rheolaveur General Construction Ld. .. .. .. —
Rhodes, S. & Co. Ld. .. 49
Rhymney Engineering Co. Ld. —
Richards, Chas. & Sons Ld. .. —
Richards Structural Steel Co. Ld. .. .. .. —
Richardsons Westgarth Atomic Ld. 47
Richardsons Westgarth (Hartlepool) Ld. .. 47
Rigley, Wm. & Sons Ld. .. —
Robertson, W. H. A. & Co. Ld. —
Robey & Co. Ld. .. .. —
Rocol Ld. .. .. .. —
Rolled Steel Products (London) Ld. .. .. .. —
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Skinningrove Iron Co. Ld. .. 20
Smallman, Jas. W. Ld. .. 52
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Stanton Ironworks Co. Ld. .. 36
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Steel Co. of Wales Ld. .. —
Steels Engineering Products Ld. .. .. .. —
Steelway Ld. .. .. .. —
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Visco Engineering Co. Ld. .. 21

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Warner & Co. Ld. .. .. —
Wellman Bibby Co. Ld. .. —
Wellman Smith Owen Engineering Corporation Ld. .. 33
West Bromwich Spring Co. Ld. —
Westinghouse Brake & Signal Co. Ld. .. .. .. —
West's (Manchester) Ld. .. 62
West's Piling & Construction Co. Ld. .. .. .. —
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Wild, M. B. & Co. Ld. .. 59
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Wincott, G. P. Ld. .. .. —
Wombwell Foundry & Engineering Co. Ld. 56
Wood, Hugh & Co. Ld. .. 11
Woodall-Duckham Construction Company Limited .. 27
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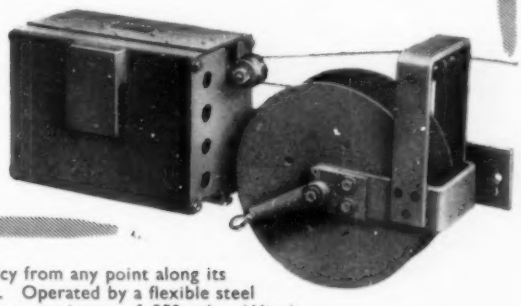

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British Timken: Division of the Timken Roller Bearing Co. .. .. .. —
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Cleveland Bridge & Engineering Co. Ltd. .. .. —
Cohen Bros. (Electrical) Ltd. —
Cohen, Geo. Sons & Co. Ltd. .. —
Colvilles Ltd. 18
Conflow Ltd. .. .. .. —
Consett Iron Co. Ltd. .. 34
Consolidated Pneumatic Tool Co. Ltd. .. .. .. —
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Cooper Roller Bearings Co. Ltd. —
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Coulson, M. & Co. Ltd. .. 52
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Crawley Industrial Products Ltd. .. .. .. 28 & 29
Cripps, R. & Co. Ltd. .. —
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Crompton Parkinson Ltd. .. 26
Crone & Taylor Ltd. 32
Crushing, Screening & Engineering Ltd. 8
Curtis, A. L. (Onx) Ltd. .. —

Davenport Engineering Co. Ltd. 52
Davey, Paxman & Co. Ltd. .. —
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Dobson, W. E. & F. Ltd. .. —
Dollery & Palmer Ltd. .. 12
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Gas Council .. .. .. —
General Electric Co. Ltd. .. 24
General Refractories Ltd. .. —
Gent & Co. Ltd. 59
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Halesowen Steel Co. Ltd. 56
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Head, Wrightson Machine Co. Ltd. .. .. .. —
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Humber Graving Dock and Engineering Co. Ltd. .. 47
Hunsley Engine Co. Ltd. —
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(*Continued on page 58*)

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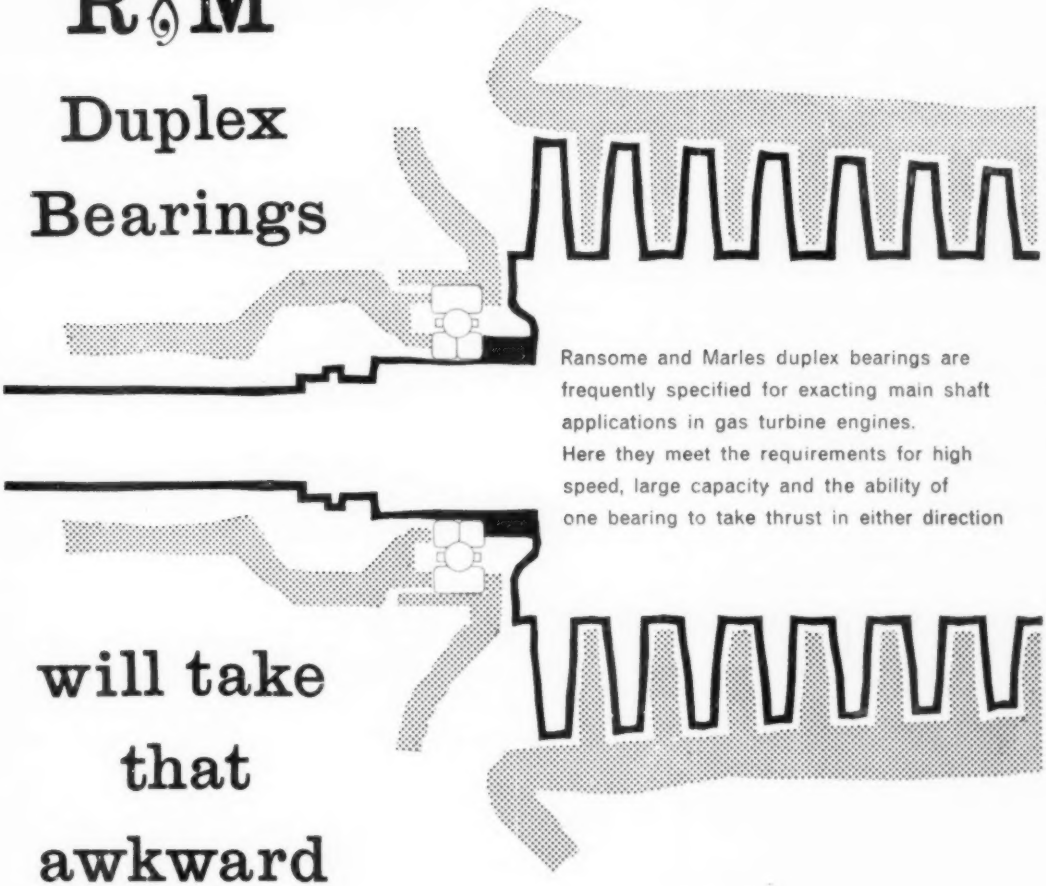

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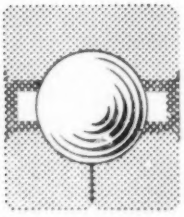

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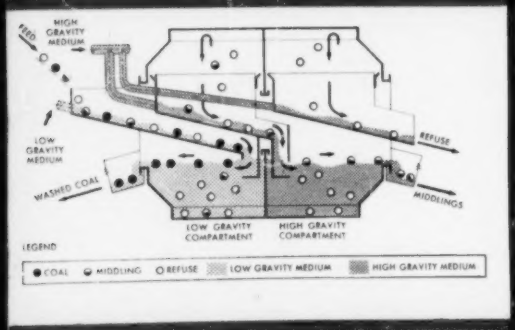

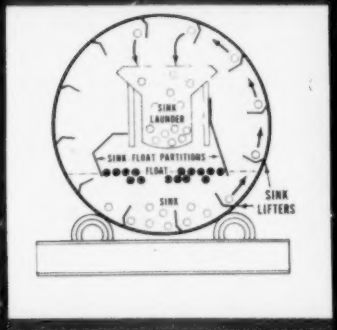

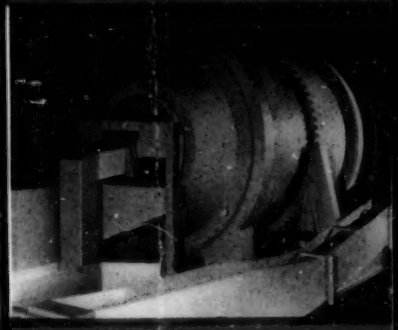

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